FIG. 1

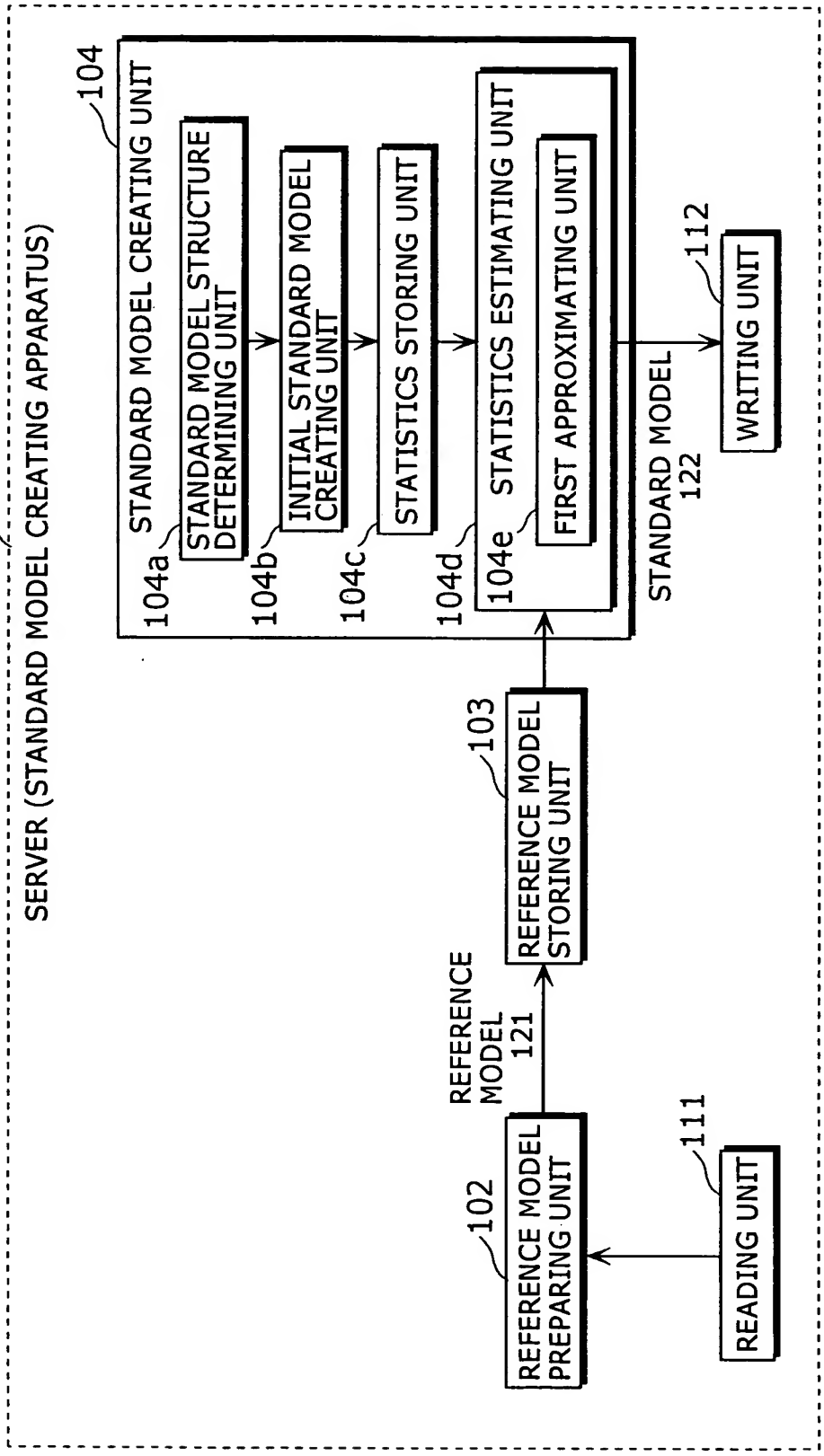
101
SERVER (STANDARD MODEL CREATING APPARATUS)
104
STANDARD MODEL CREATING UNIT
104a
STANDARD MODEL STRUCTURE DETERMINING UNIT
104b
INITIAL STANDARD MODEL CREATING UNIT
104c
STATISTICS STORING UNIT
104d
104e
STATISTICS ESTIMATING UNIT
FIRST APPROXIMATING UNIT
STANDARD MODEL
122
112
WRITING UNIT
103
REFERENCE MODEL STORING UNIT
REFERENCE MODEL
121
102
REFERENCE MODEL PREPARING UNIT
111
READING UNIT

FIG. 2

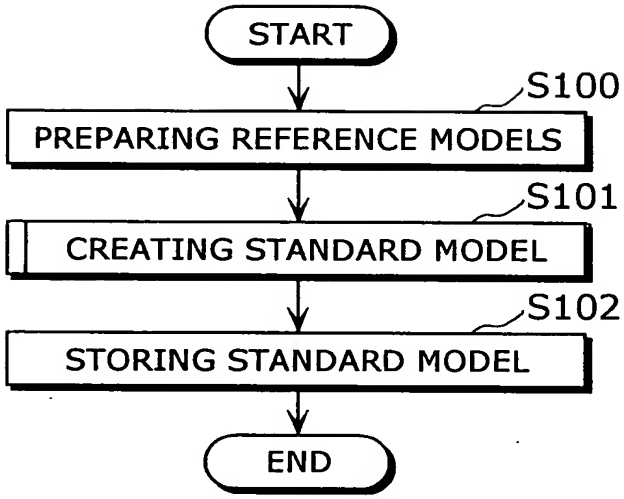
START
S100
PREPARING REFERENCE MODELS
S101
CREATING STANDARD MODEL
S102
STORING STANDARD MODEL
END

FIG. 3

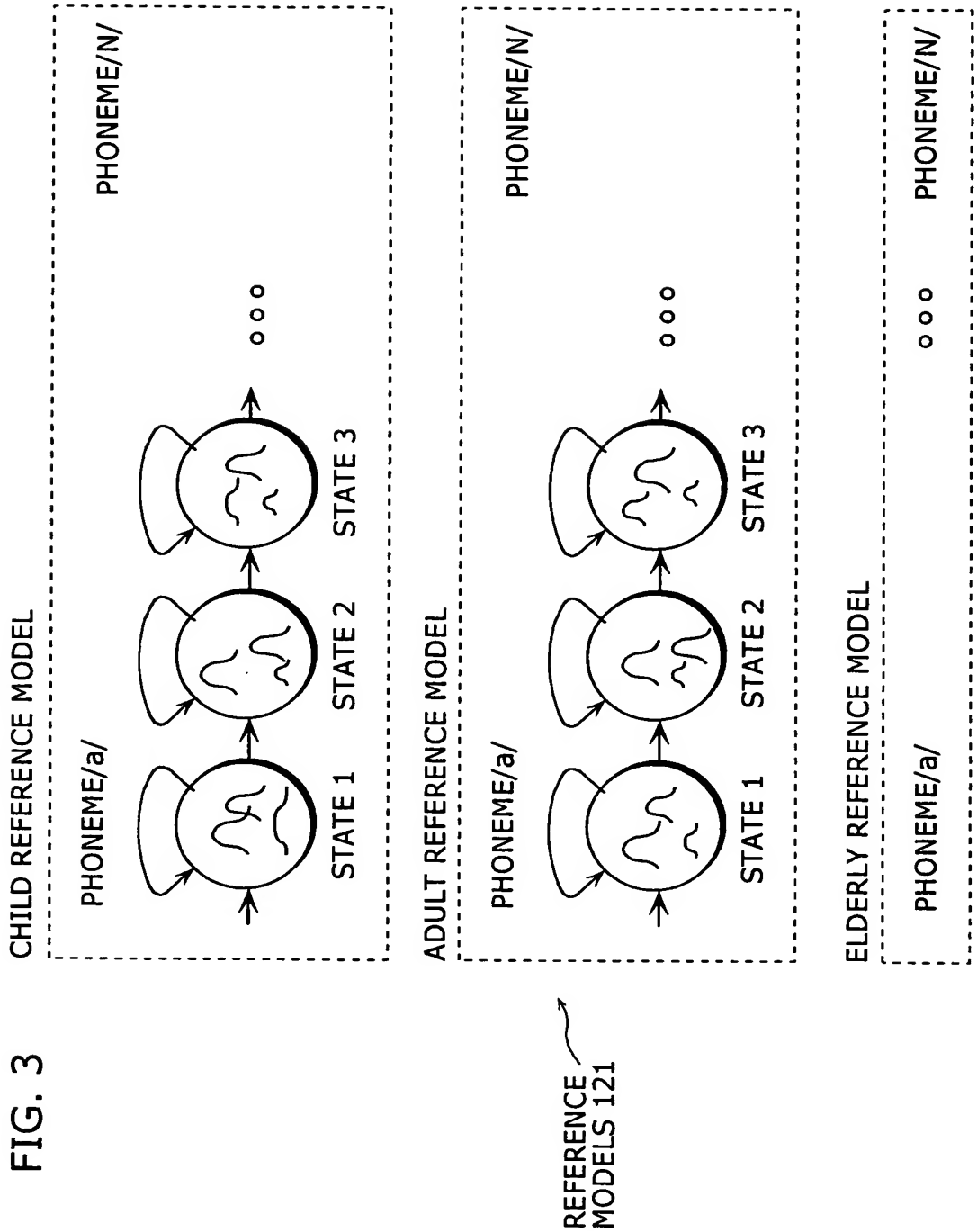
CHILD REFERENCE MODEL
PHONEME/N/
PHONEME/a/
STATE 1
STATE 2
STATE 3
ADULT REFERENCE MODEL
PHONEME/N/
PHONEME/a/
STATE 1
STATE 2
STATE 3
ELDERLY REFERENCE MODEL
PHONEME/N/
PHONEME/a/
REFERENCE MODELS 121

FIG. 4

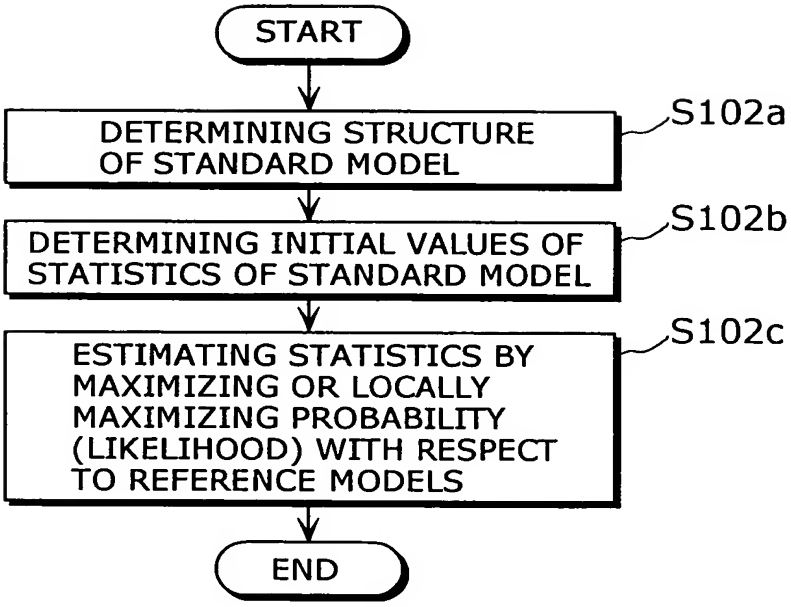
START
DETERMINING STRUCTURE OF STANDARD MODEL
S102a
DETERMINING INITIAL VALUES OF STATISTICS OF STANDARD MODEL
S102b
ESTIMATING STATISTICS BY MAXIMIZING OR LOCALLY MAXIMIZING PROBABILITY (LIKELIHOOD) WITH RESPECT TO REFERENCE MODELS
S102c
END

FIG. 5A

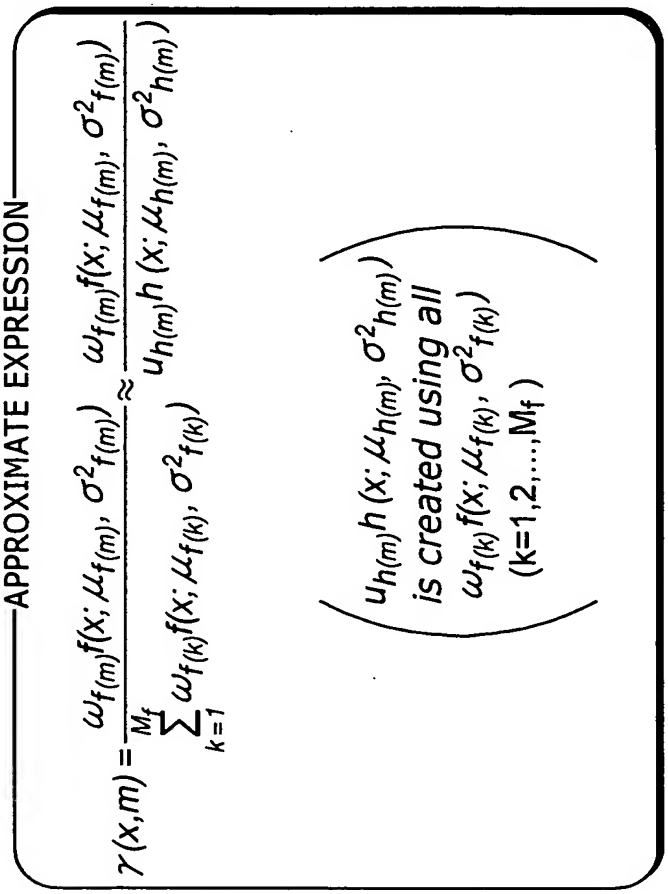
APPROXIMATE EXPRESSION
$\gamma(x,m) = \frac{\omega_{f(m)} f(x; \mu_{f(m)}, \sigma^2_{f(m)})}{\sum_{k=1}^{M_f} \omega_{f(k)} f(x; \mu_{f(k)}, \sigma^2_{f(k)})} \approx \frac{\omega_{f(m)} f(x; \mu_{f(m)}, \sigma^2_{f(m)})}{u_{h(m)} h(x; \mu_{h(m)}, \sigma^2_{h(m)})}$
$u_{h(m)} h(x; \mu_{h(m)}, \sigma^2_{h(m)})$
is created using all
$\omega_{f(k)} f(x; \mu_{f(k)}, \sigma^2_{f(k)})$
(k=1,2,...,M_f)

FIG. 5B

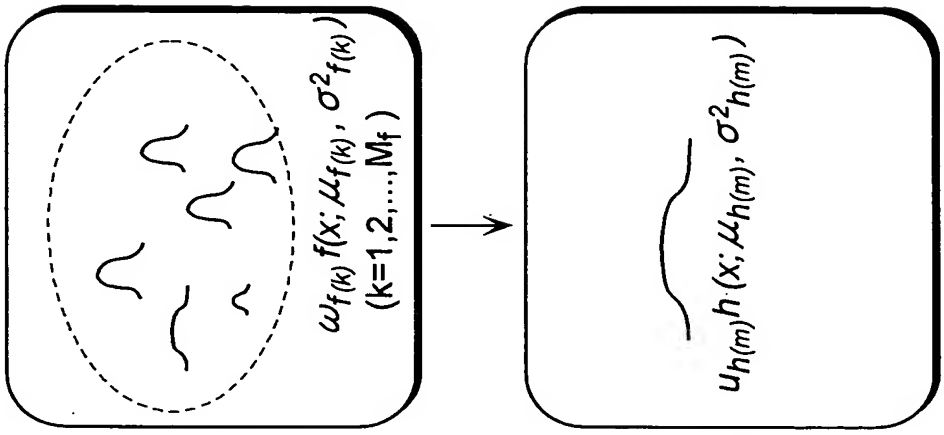
$\omega_{f(k)} f(x; \mu_{f(k)}, \sigma^2_{f(k)})$
(k=1,2,...,M_f)
$u_{h(m)} h(x; \mu_{h(m)}, \sigma^2_{h(m)})$

FIG. 6A

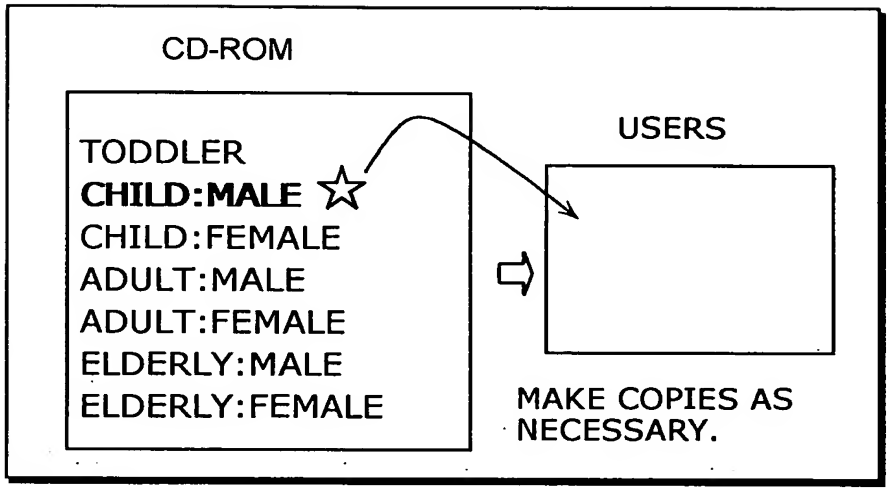
CD-ROM
TODDLER
CHILD:MALE
CHILD:FEMALE
ADULT:MALE
ADULT:FEMALE
ELDERLY:MALE
ELDERLY:FEMALE
USERS
MAKE COPIES AS NECESSARY.

FIG. 6B

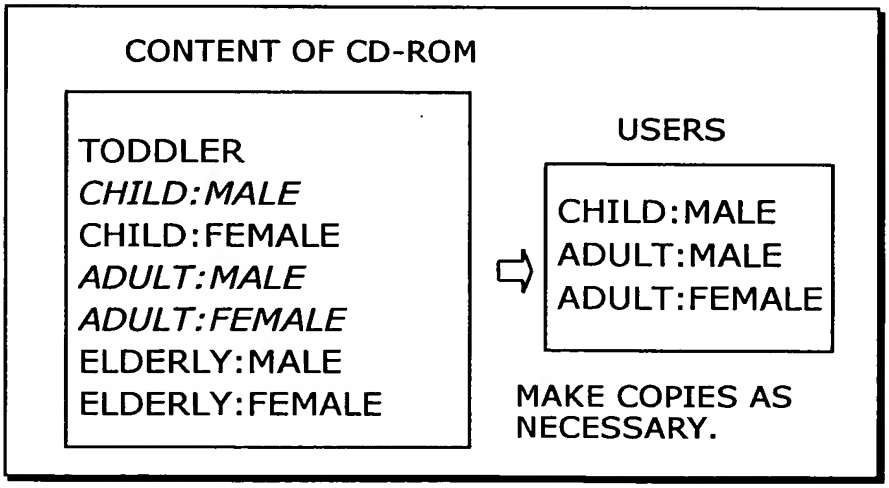
CONTENT OF CD-ROM
TODDLER
CHILD:MALE
CHILD:FEMALE
ADULT:MALE
ADULT:FEMALE
ELDERLY:MALE
ELDERLY:FEMALE
USERS
CHILD:MALE
ADULT:MALE
ADULT:FEMALE
MAKE COPIES AS NECESSARY.

FIG. 7A

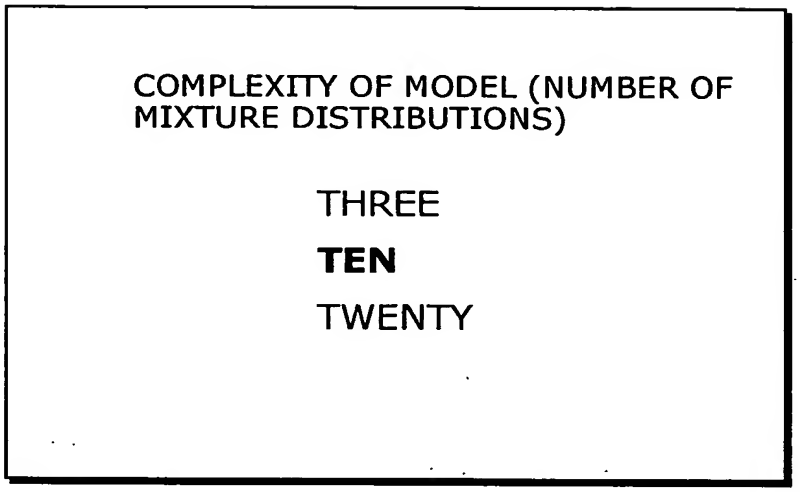
COMPLEXITY OF MODEL (NUMBER OF MIXTURE DISTRIBUTIONS)
THREE
TEN
TWENTY

FIG. 7B

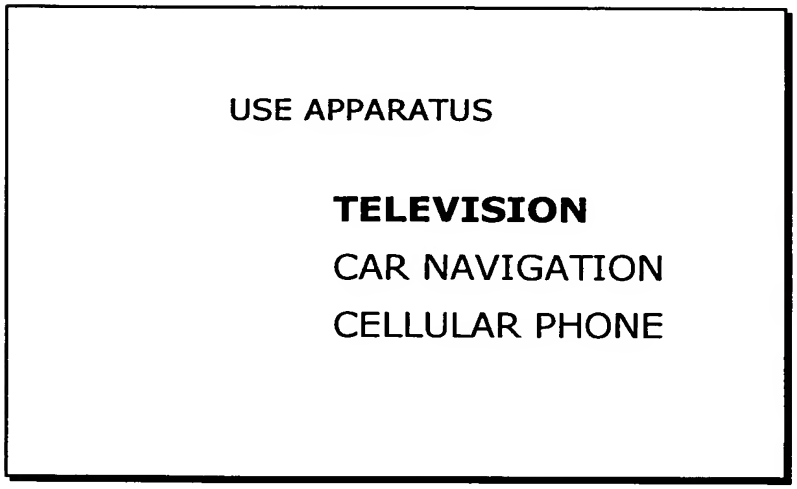
USE APPARATUS
TELEVISION
CAR NAVIGATION
CELLULAR PHONE

FIG. 8A

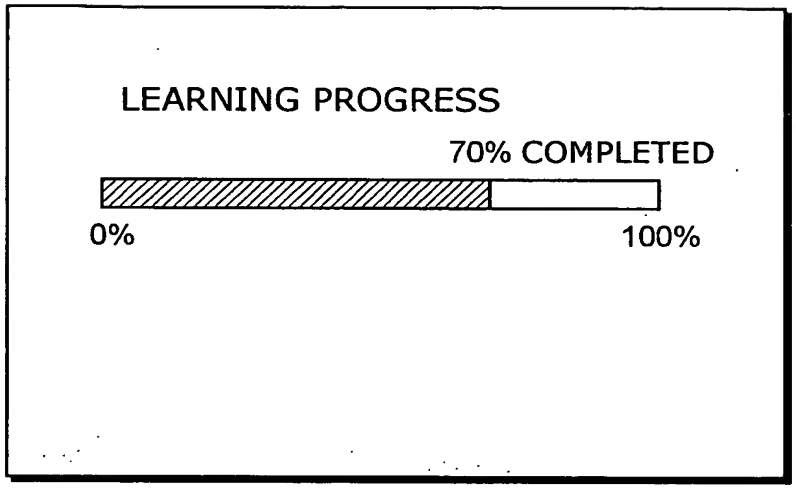
LEARNING PROGRESS
70% COMPLETED
0%
100%

FIG. 8B

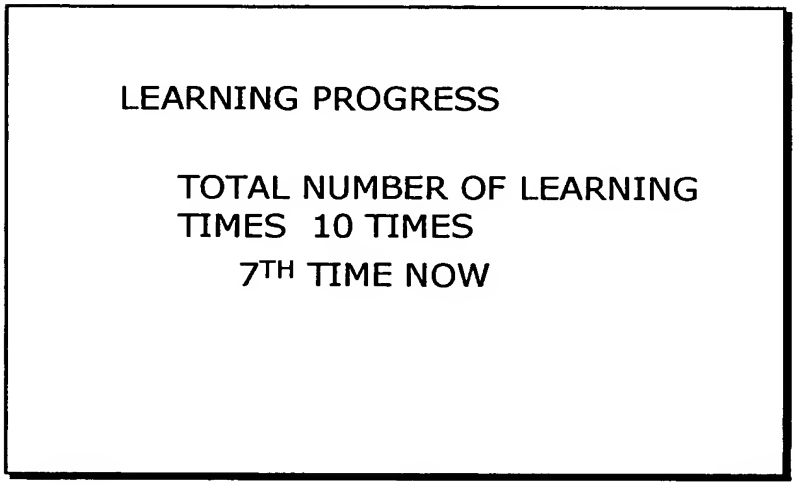
LEARNING PROGRESS
TOTAL NUMBER OF LEARNING TIMES 10 TIMES
7TH TIME NOW

FIG. 9

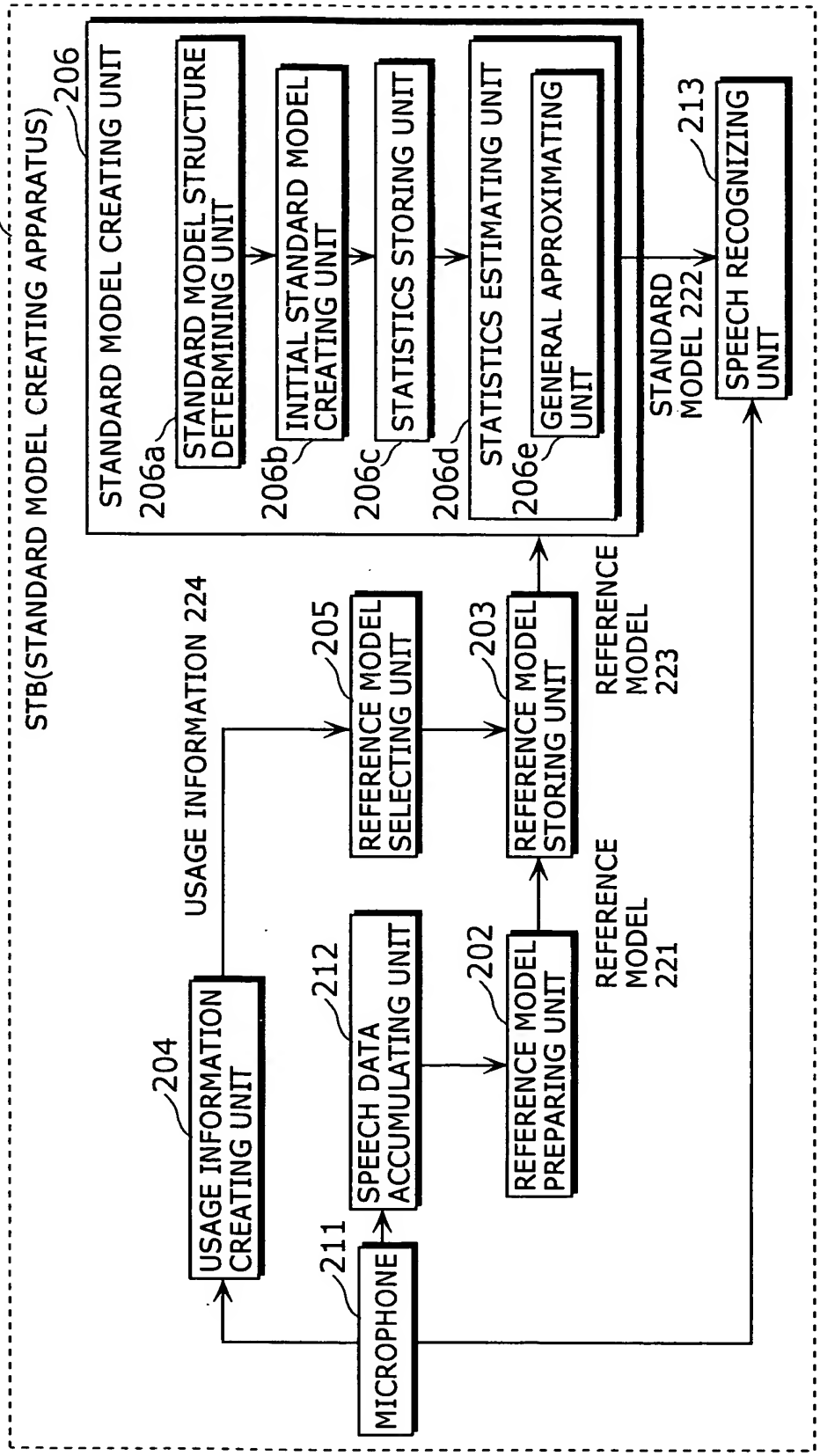
201
STB(STANDARD MODEL CREATING APPARATUS)
206
STANDARD MODEL CREATING UNIT
206a
STANDARD MODEL STRUCTURE DETERMINING UNIT
206b
INITIAL STANDARD MODEL CREATING UNIT
206c
STATISTICS STORING UNIT
206d
STATISTICS ESTIMATING UNIT
206e
GENERAL APPROXIMATING UNIT
STANDARD MODEL 222
213
SPEECH RECOGNIZING UNIT
USAGE INFORMATION 224
205
REFERENCE MODEL SELECTING UNIT
203
REFERENCE MODEL STORING UNIT
REFERENCE MODEL 223
204
USAGE INFORMATION CREATING UNIT
212
SPEECH DATA ACCUMULATING UNIT
202
REFERENCE MODEL PREPARING UNIT
REFERENCE MODEL 221
211
MICROPHONE

FIG. 10

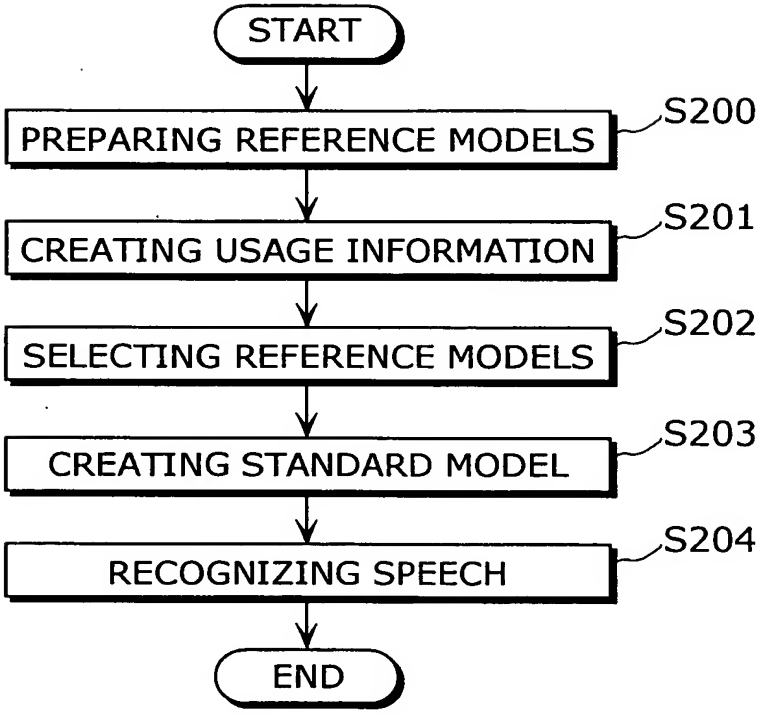
START
PREPARING REFERENCE MODELS
S200
CREATING USAGE INFORMATION
S201
SELECTING REFERENCE MODELS
S202
CREATING STANDARD MODEL
S203
RECOGNIZING SPEECH
S204
END

FIG. 11

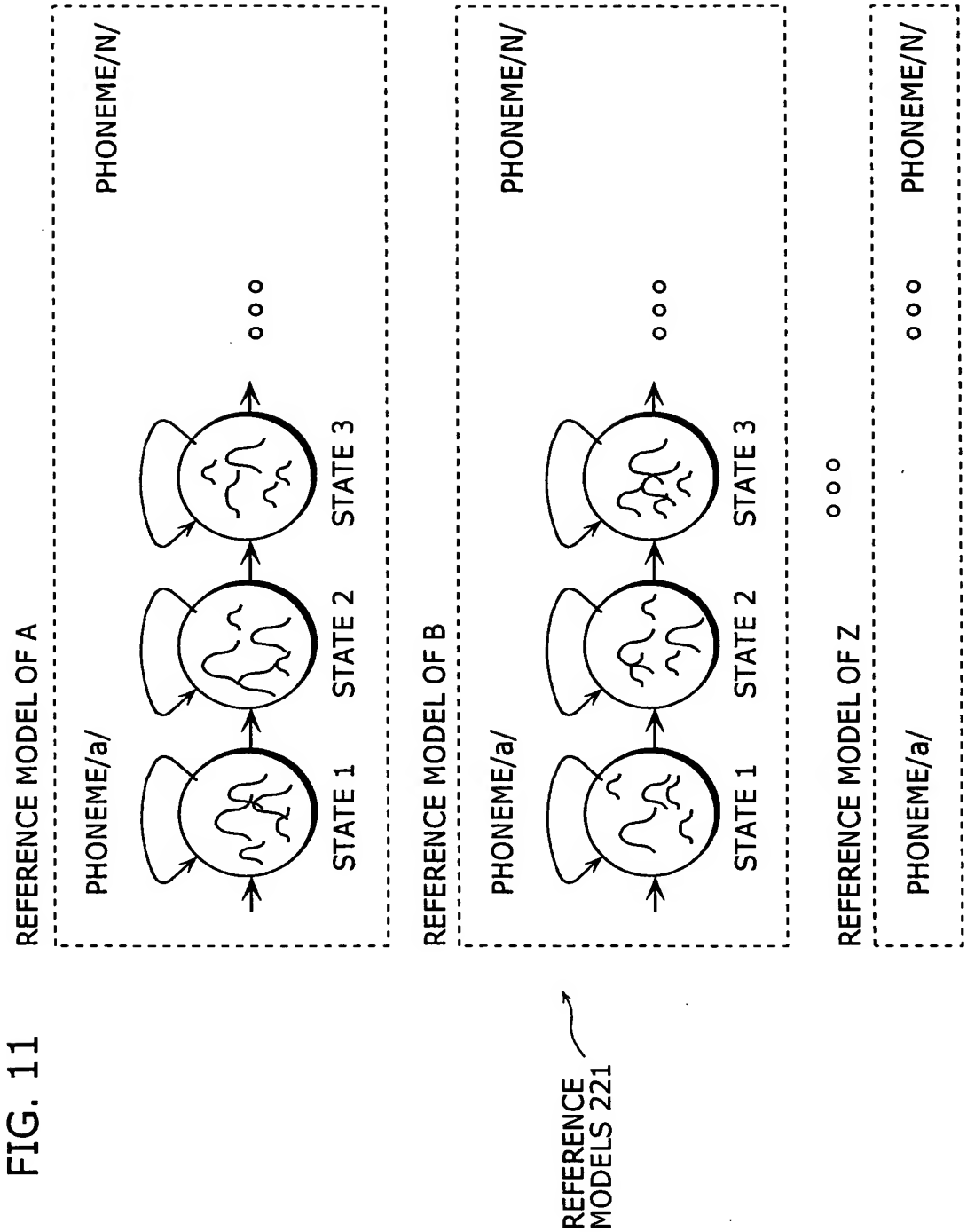
REFERENCE MODEL OF A
PHONEME/a/
STATE 1
STATE 2
STATE 3
PHONEME/N/
REFERENCE MODEL OF B
PHONEME/a/
STATE 1
STATE 2
STATE 3
PHONEME/N/
REFERENCE MODEL OF Z
PHONEME/a/
PHONEME/N/
REFERENCE MODELS 221

FIG. 12A

APPROXIMATE EXPRESSION

$$\gamma(x,m)=\frac{\omega_{f(m)}f(x;\mu_{f(m)},\sigma^2_{f(m)})}{\sum_{k=1}^{M_f}\omega_{f(k)}f(x;\mu_{f(k)},\sigma^2_{f(k)})}\approx\frac{\omega_{f(m)}f(x;\mu_{f(m)},\sigma^2_{f(m)})}{u_{h(m)}h(x;\mu_{h(m)},\sigma^2_{h(m)})}$$

$u_{h(m)}h(x;\mu_{h(m)},\sigma^2_{h(m)})$
is created using
$\omega_{f(k)}f(x;\mu_{f(k)},\sigma^2_{f(k)})$
$(k=1,2,\ldots,P_{h(m)})$ where $P_{h(m)}$ is one or more,
that is close to
$\omega_{f(m)}f(x;\mu_{f(m)},\sigma^2_{f(m)})$

DISTANCES : MEAN EUCLIDEAN DISTANCE,
MAHALANOBIS DISTANCE,
KULLBACK-LEIBLER (KL) DISTANCE, ETC.

FIG. 12B

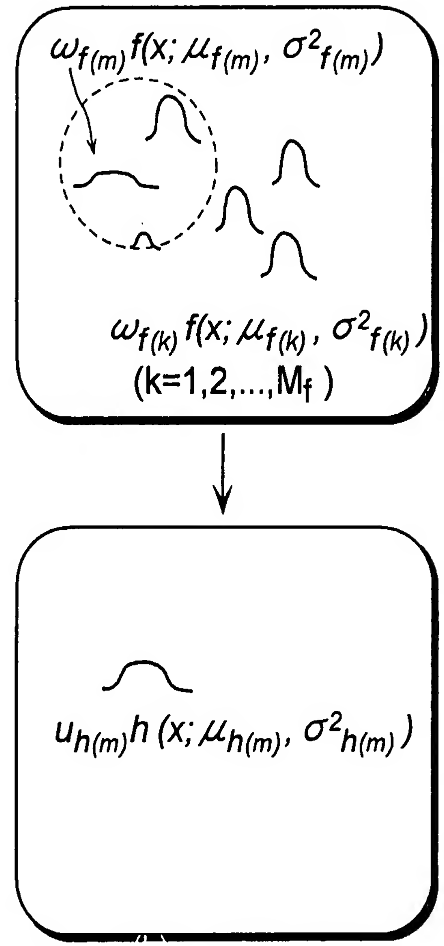

FIG. 13

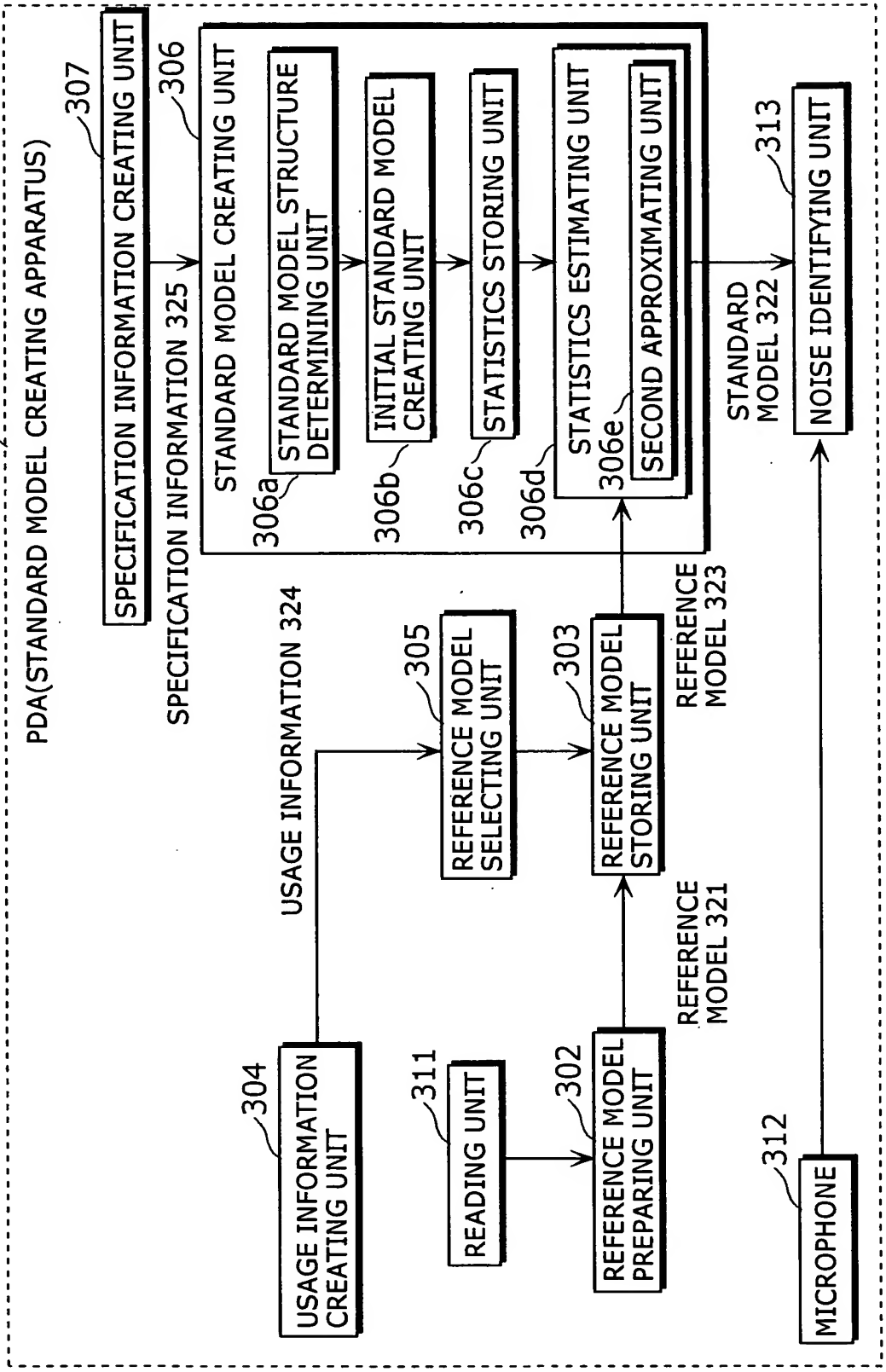
301
PDA(STANDARD MODEL CREATING APPARATUS)
307
SPECIFICATION INFORMATION CREATING UNIT
SPECIFICATION INFORMATION 325
306
STANDARD MODEL CREATING UNIT
306a
STANDARD MODEL STRUCTURE DETERMINING UNIT
306b
INITIAL STANDARD MODEL CREATING UNIT
306c
STATISTICS STORING UNIT
306d
STATISTICS ESTIMATING UNIT
306e
SECOND APPROXIMATING UNIT
STANDARD MODEL 322
313
NOISE IDENTIFYING UNIT
USAGE INFORMATION 324
305
REFERENCE MODEL SELECTING UNIT
303
REFERENCE MODEL STORING UNIT
REFERENCE MODEL 323
REFERENCE MODEL 321
304
USAGE INFORMATION CREATING UNIT
311
READING UNIT
302
REFERENCE MODEL PREPARING UNIT
312
MICROPHONE

FIG. 14

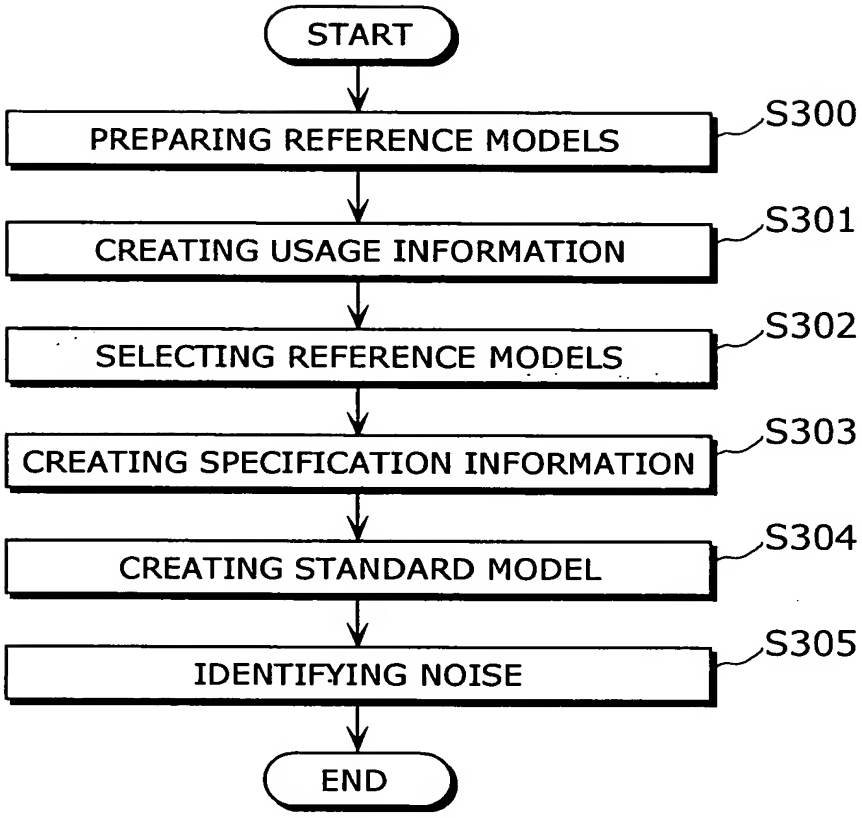
START
PREPARING REFERENCE MODELS
S300
CREATING USAGE INFORMATION
S301
SELECTING REFERENCE MODELS
S302
CREATING SPECIFICATION INFORMATION
S303
CREATING STANDARD MODEL
S304
IDENTIFYING NOISE
S305
END

FIG. 15

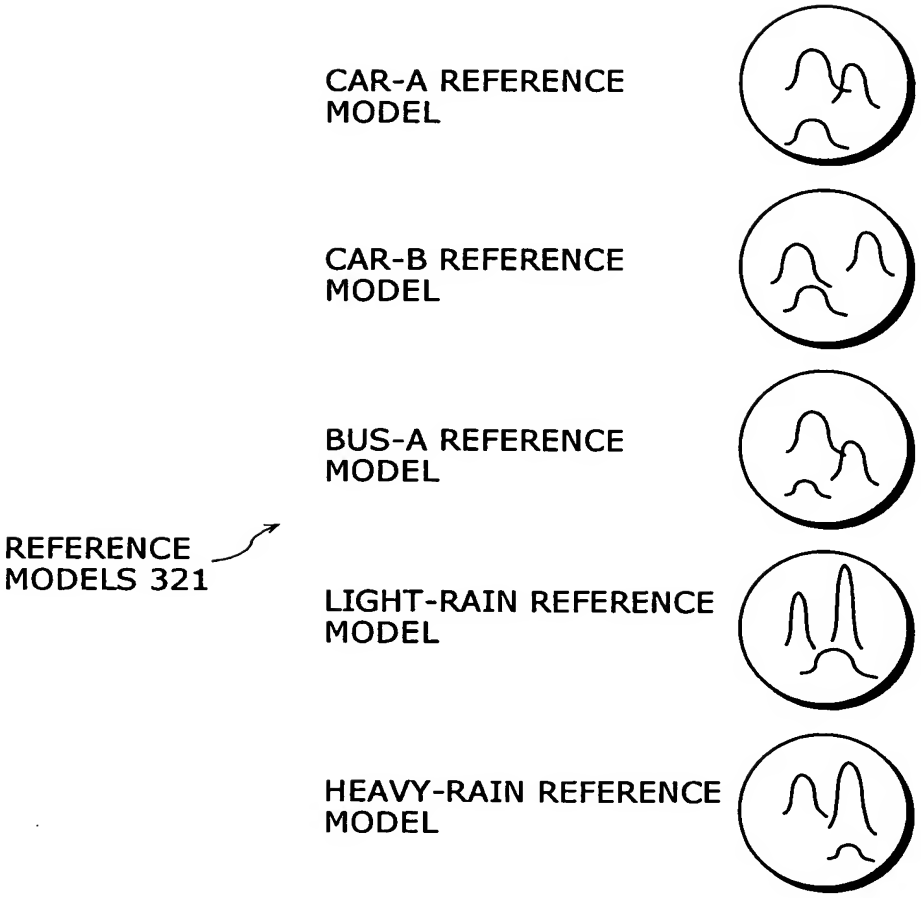
CAR-A REFERENCE MODEL
CAR-B REFERENCE MODEL
BUS-A REFERENCE MODEL
REFERENCE MODELS 321
LIGHT-RAIN REFERENCE MODEL
HEAVY-RAIN REFERENCE MODEL

FIG. 16

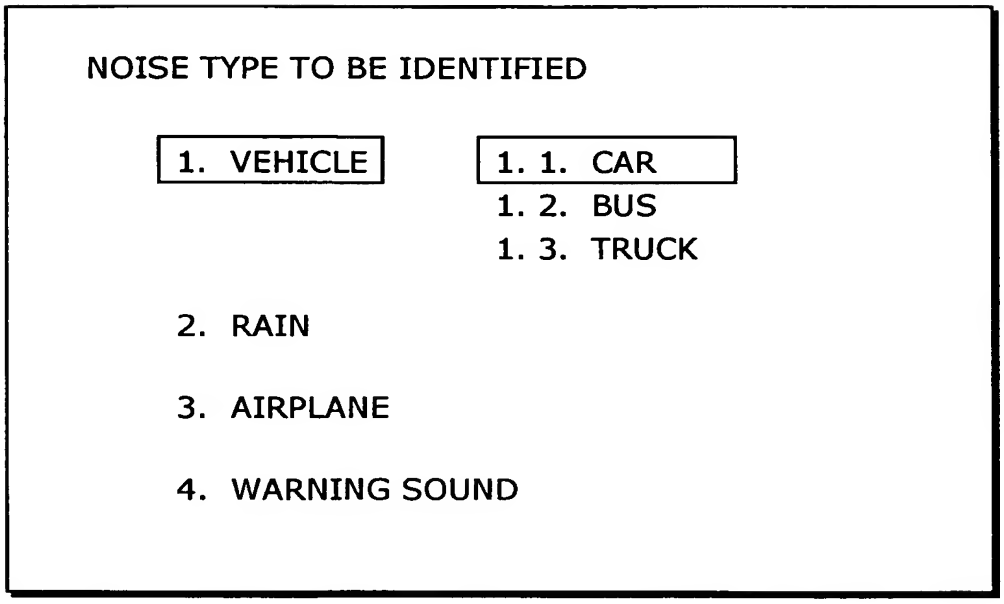
NOISE TYPE TO BE IDENTIFIED
1. VEHICLE
1. 1. CAR
1. 2. BUS
1. 3. TRUCK
2. RAIN
3. AIRPLANE
4. WARNING SOUND

FIG. 17

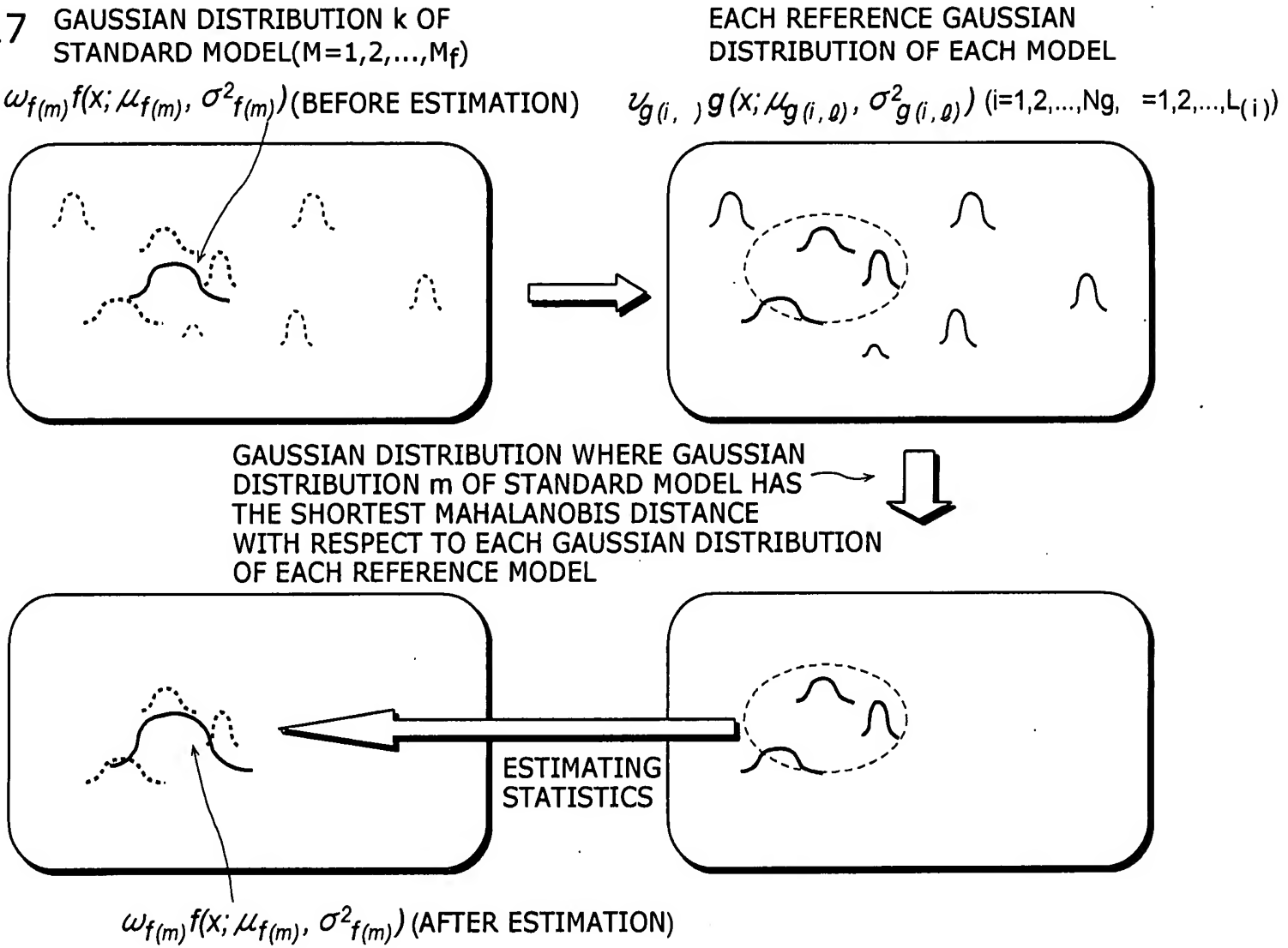
GAUSSIAN DISTRIBUTION k OF STANDARD MODEL(M=1,2,...,Mf)
EACH REFERENCE GAUSSIAN DISTRIBUTION OF EACH MODEL
ωf(m)f(x; μf(m), σ2f(m)) (BEFORE ESTIMATION)
υg(i,)g(x; μg(i,ℓ), σ2g(i,ℓ)) (i=1,2,...,Ng, =1,2,...,L(i))
GAUSSIAN DISTRIBUTION WHERE GAUSSIAN DISTRIBUTION m OF STANDARD MODEL HAS THE SHORTEST MAHALANOBIS DISTANCE WITH RESPECT TO EACH GAUSSIAN DISTRIBUTION OF EACH REFERENCE MODEL
ESTIMATING STATISTICS
ωf(m)f(x; μf(m), σ2f(m)) (AFTER ESTIMATION)

FIG. 18A

APPROXIMATE EXPRESSION

$$\gamma(x,m)=\frac{\omega_{f(m)}f(x;\mu_{f(m)},\sigma^2{}_{f(m)})}{\sum_{k=1}^{M_f}\omega_{f(k)}f(x;\mu_{f(k)},\sigma^2{}_{f(k)})}\approx 1.0$$

INDEX (m) OF
$\omega_{f(m)}f(x;\mu_{f(m)},\sigma^2{}_{f(m)})$ (m=1,2,...,M_f)
WHICH IS CLOSEST TO
$\upsilon_{g(i,\ell)}g(x;\mu_{g(i,\ell)},\sigma^2{}_{g(i,\ell)})$ (i=1,2,...,Ng, ℓ=1,2,...,$L_{(i)}$)
IS DETERMINED.
STATISTICS OF
$\omega_{f(m)}f(x;\mu_{f(m)},\sigma^2{}_{f(m)})$ (m=1,2,...,M_f) IS OBTAINED
USING
$\upsilon_{g(i,\ell)}g(x;\mu_{g(i,\ell)},\sigma^2{}_{g(i,\ell)})$ (i=1,2,...,Ng; =1,2,...,$L_{(i)}$)
TO WHITCH INDEX (m) HAS BEEN ASSIGNED,
ACCORDING TO STATISTICS PROCESSING
CALCULATION SIMILAR TO "METHOD USING
SUFFICIENT STATISTICS (NONPATENT LITERATURE 2)".

DISTANCES : MEAN EUCLIDEAN DISTANCE,
MAHALANOBIS DISTANCE,
KULLBACK-LEIBLER (KL) DISTANCE, ETC.

FIG. 18B

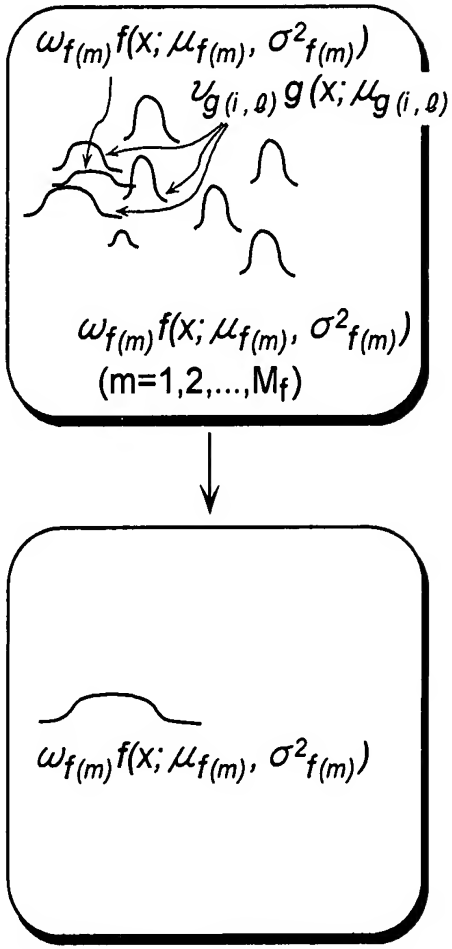

FIG. 19

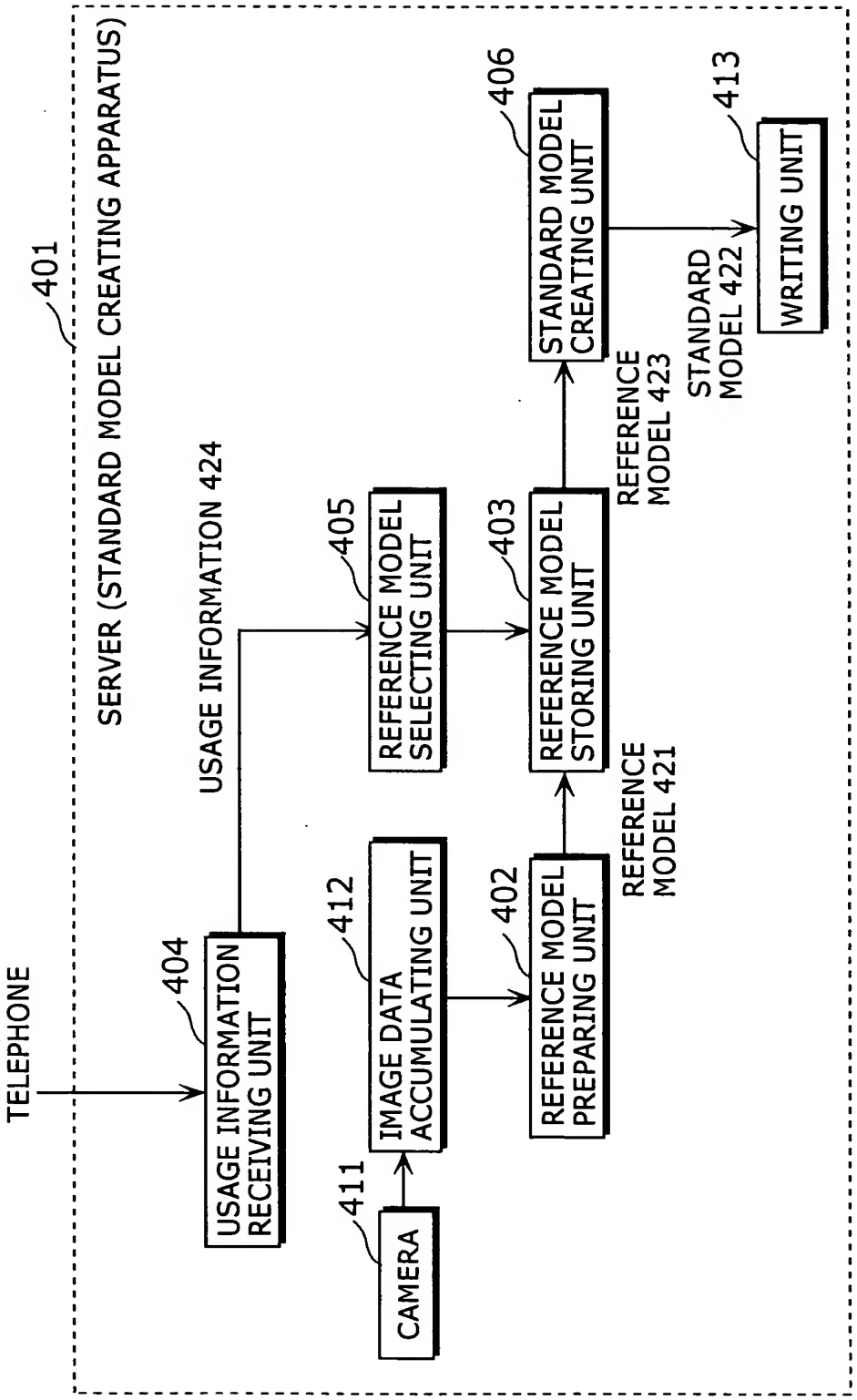
SERVER (STANDARD MODEL CREATING APPARATUS)
401
TELEPHONE
414
USAGE INFORMATION RECEIVING UNIT
404
USAGE INFORMATION 424
CAMERA
411
IMAGE DATA ACCUMULATING UNIT
412
REFERENCE MODEL SELECTING UNIT
405
REFERENCE MODEL PREPARING UNIT
402
REFERENCE MODEL STORING UNIT
403
REFERENCE MODEL 421
REFERENCE MODEL 423
STANDARD MODEL CREATING UNIT
406
STANDARD MODEL 422
WRITING UNIT
413

FIG. 20

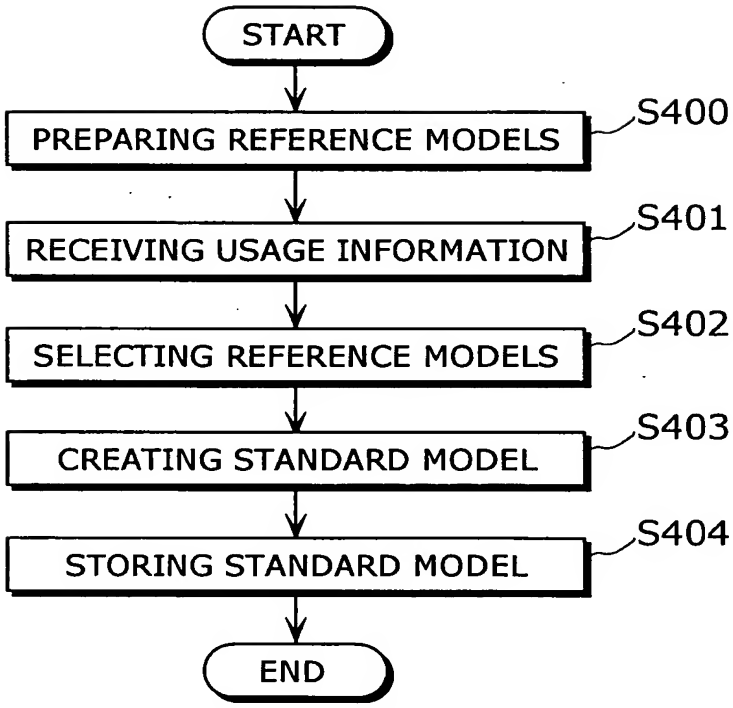
START
PREPARING REFERENCE MODELS
S400
RECEIVING USAGE INFORMATION
S401
SELECTING REFERENCE MODELS
S402
CREATING STANDARD MODEL
S403
STORING STANDARD MODEL
S404
END

FIG. 21

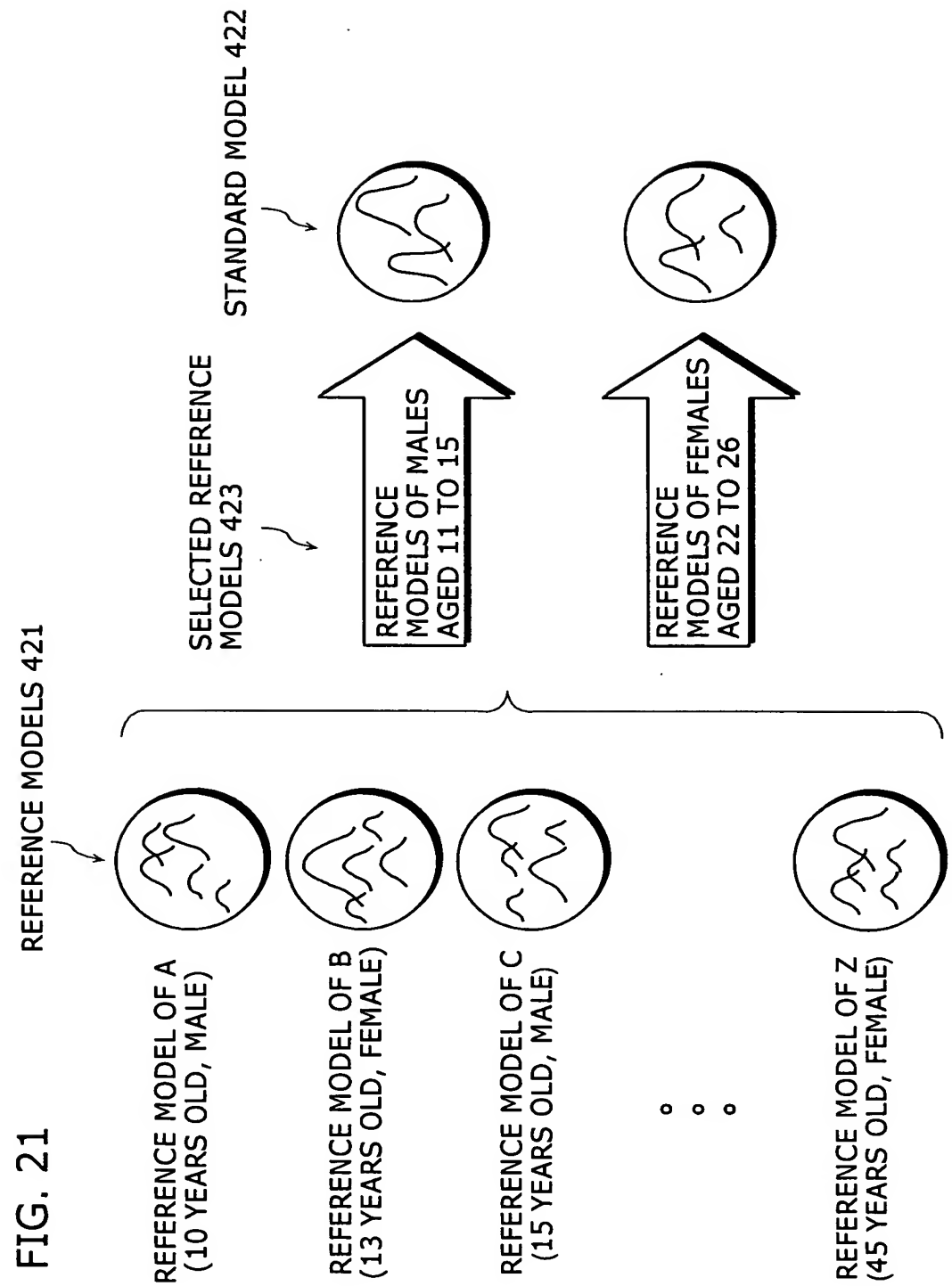
REFERENCE MODELS 421
REFERENCE MODEL OF A (10 YEARS OLD, MALE)
REFERENCE MODEL OF B (13 YEARS OLD, FEMALE)
REFERENCE MODEL OF C (15 YEARS OLD, MALE)
REFERENCE MODEL OF Z (45 YEARS OLD, FEMALE)
SELECTED REFERENCE MODELS 423
REFERENCE MODELS OF MALES AGED 11 TO 15
REFERENCE MODELS OF FEMALES AGED 22 TO 26
STANDARD MODEL 422

FIG. 22

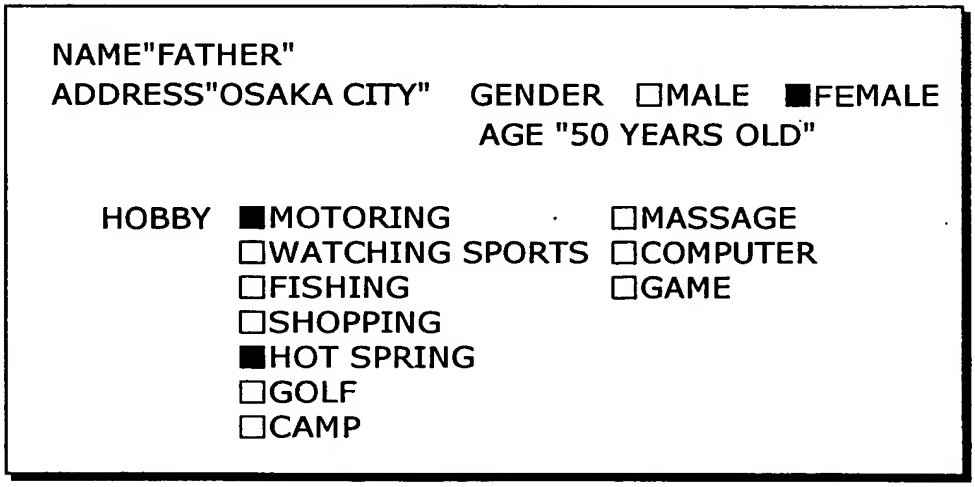
NAME"FATHER"
ADDRESS"OSAKA CITY"
GENDER ☐MALE ■FEMALE
AGE "50 YEARS OLD"
HOBBY ■MOTORING
☐WATCHING SPORTS
☐FISHING
☐SHOPPING
■HOT SPRING
☐GOLF
☐CAMP
☐MASSAGE
☐COMPUTER
☐GAME

FIG. 23

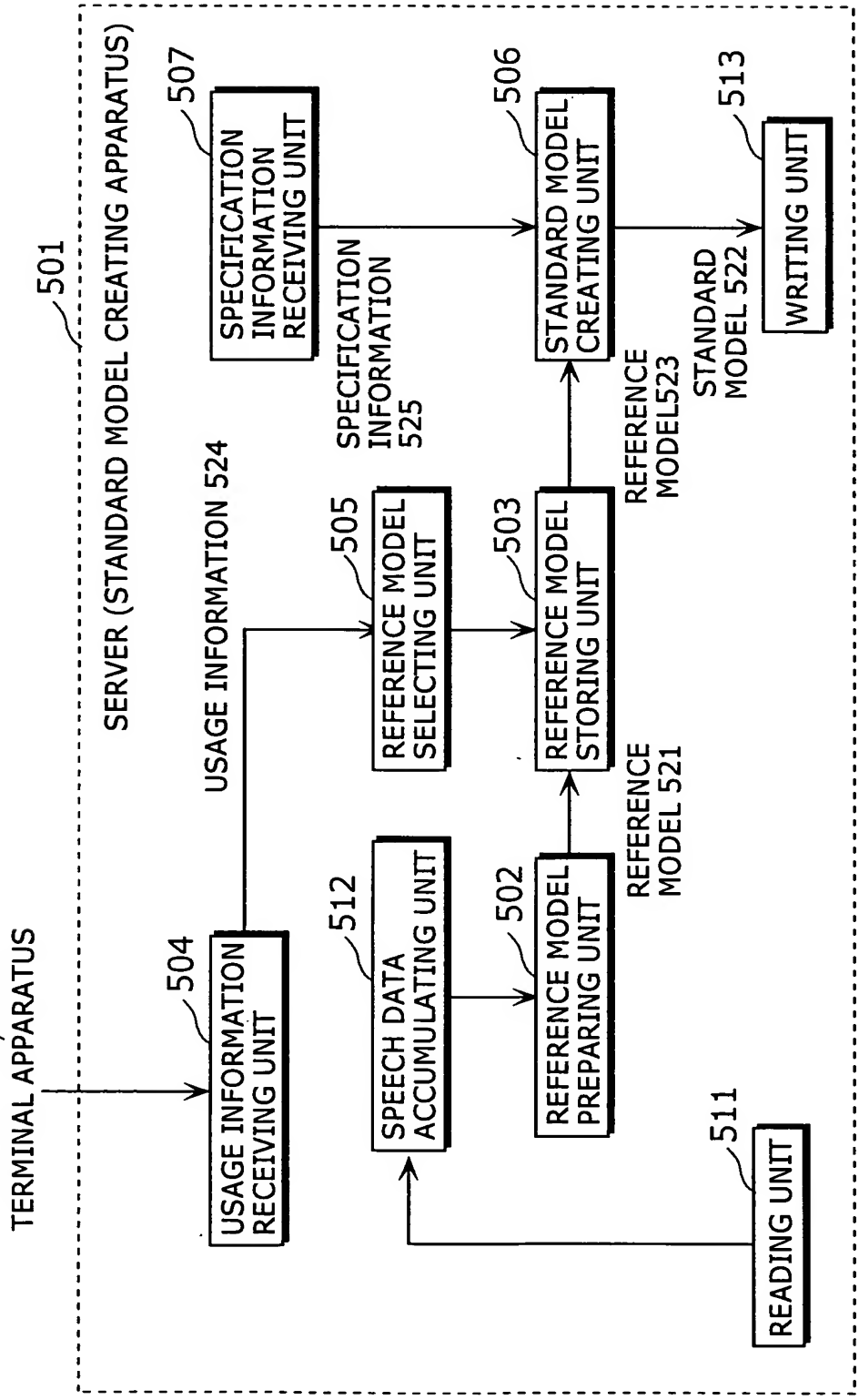
514
TERMINAL APPARATUS
501
SERVER (STANDARD MODEL CREATING APPARATUS)
504
USAGE INFORMATION RECEIVING UNIT
USAGE INFORMATION 524
512
SPEECH DATA ACCUMULATING UNIT
502
REFERENCE MODEL PREPARING UNIT
REFERENCE MODEL 521
505
REFERENCE MODEL SELECTING UNIT
503
REFERENCE MODEL STORING UNIT
REFERENCE MODEL523
507
SPECIFICATION INFORMATION RECEIVING UNIT
SPECIFICATION INFORMATION 525
506
STANDARD MODEL CREATING UNIT
STANDARD MODEL 522
513
WRITING UNIT
511
READING UNIT

FIG. 24

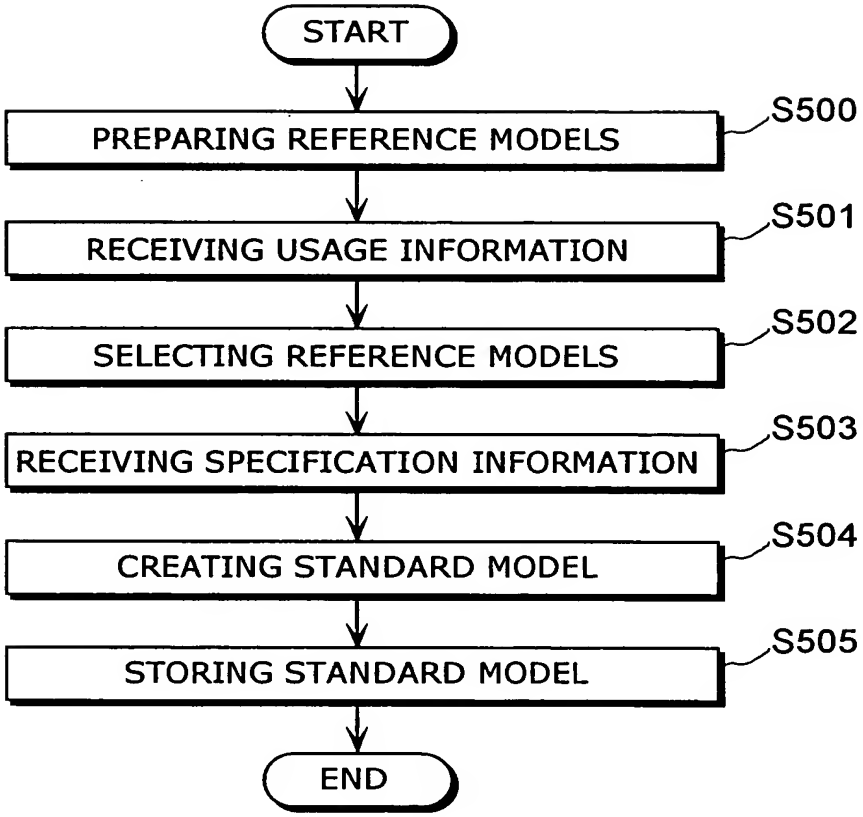
START
PREPARING REFERENCE MODELS
S500
RECEIVING USAGE INFORMATION
S501
SELECTING REFERENCE MODELS
S502
RECEIVING SPECIFICATION INFORMATION
S503
CREATING STANDARD MODEL
S504
STORING STANDARD MODEL
S505
END

FIG. 25

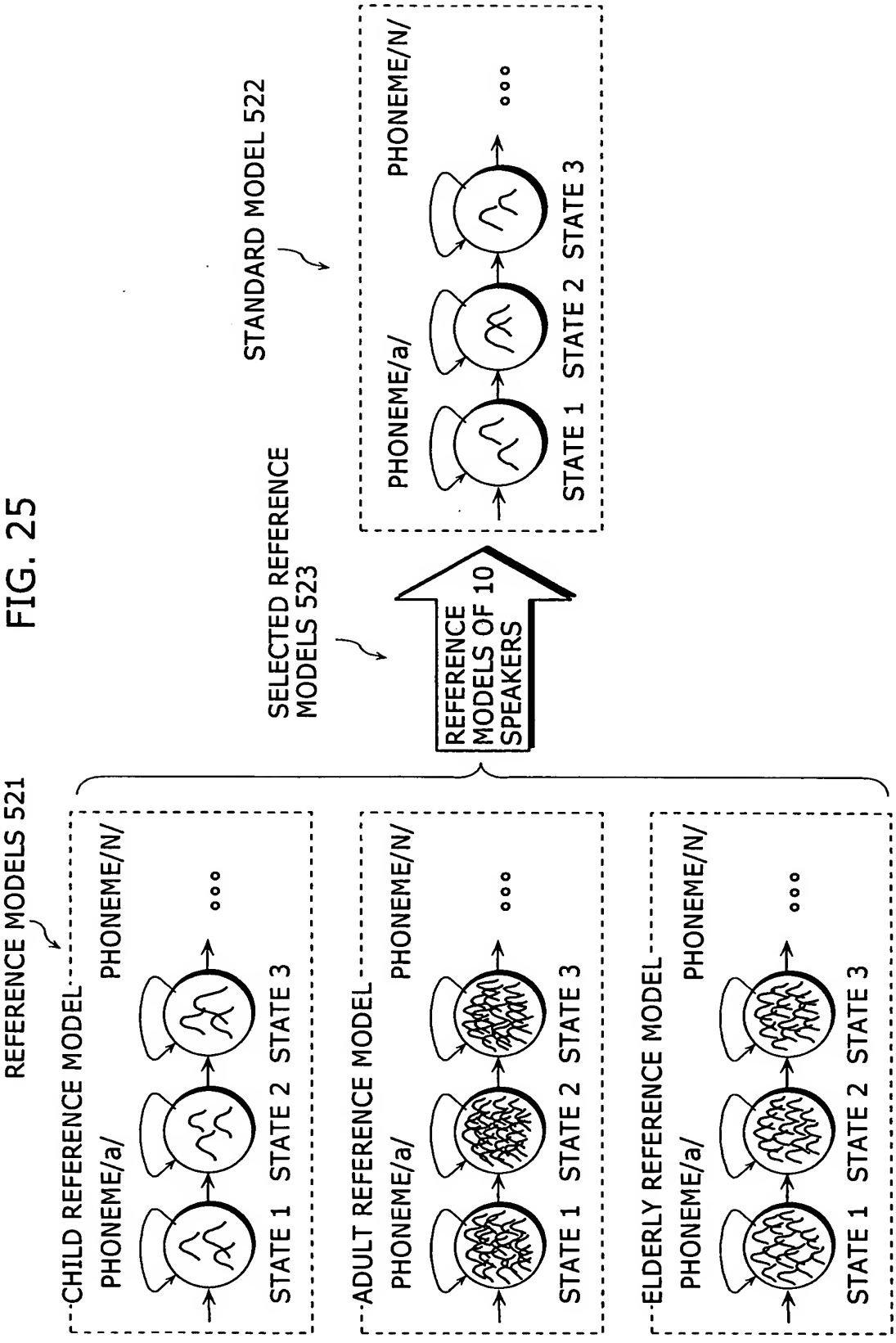
REFERENCE MODELS 521
CHILD REFERENCE MODEL
PHONEME/a/
PHONEME/N/
STATE 1 STATE 2 STATE 3
ADULT REFERENCE MODEL
PHONEME/a/
PHONEME/N/
STATE 1 STATE 2 STATE 3
ELDERLY REFERENCE MODEL
PHONEME/a/
PHONEME/N/
STATE 1 STATE 2 STATE 3
REFERENCE MODELS OF 10 SPEAKERS
SELECTED REFERENCE MODELS 523
STANDARD MODEL 522
PHONEME/a/
PHONEME/N/
STATE 1 STATE 2 STATE 3

FIG. 26

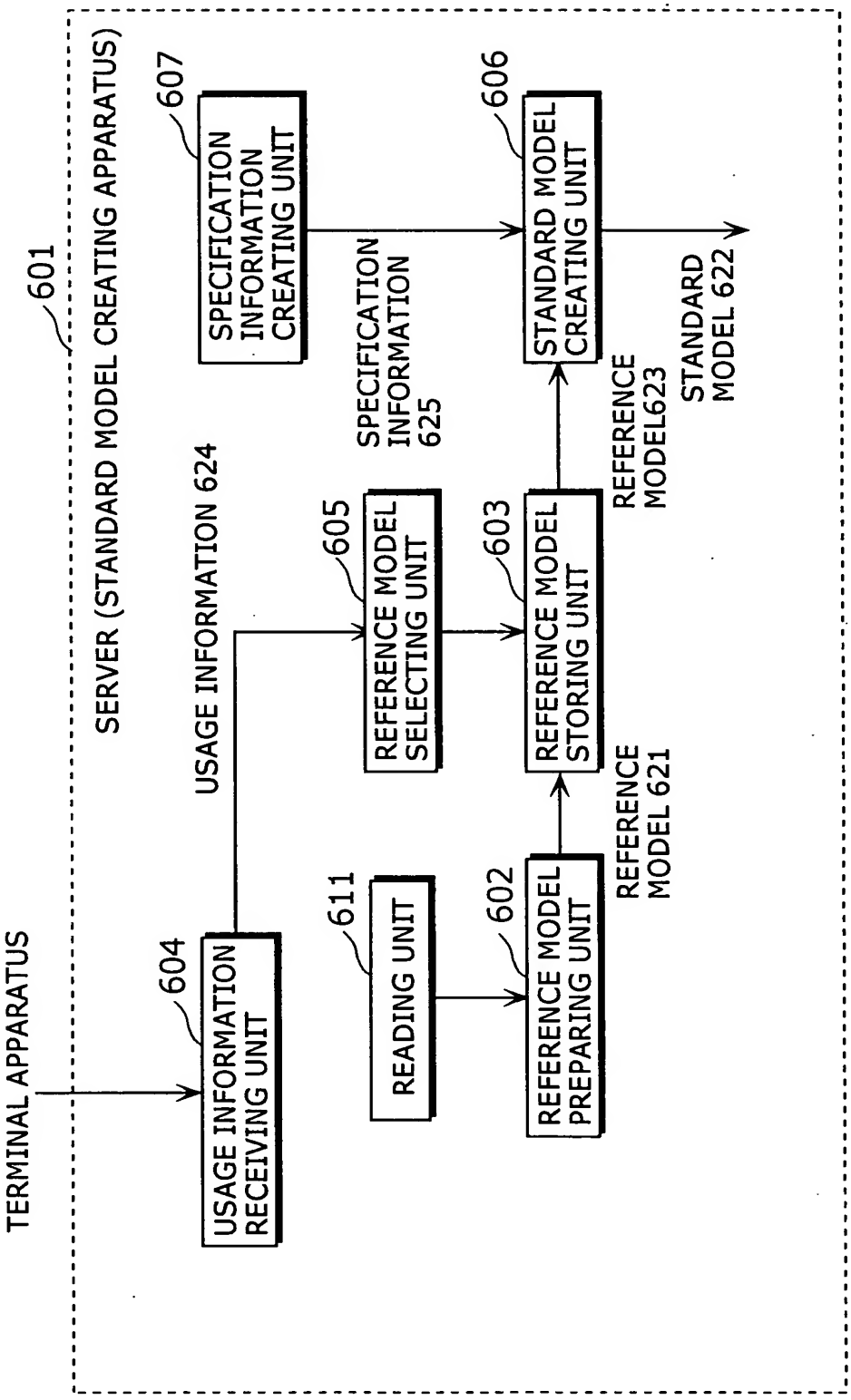
601
SERVER (STANDARD MODEL CREATING APPARATUS)
614
TERMINAL APPARATUS
604
USAGE INFORMATION RECEIVING UNIT
USAGE INFORMATION 624
611
READING UNIT
602
REFERENCE MODEL PREPARING UNIT
REFERENCE MODEL 621
605
REFERENCE MODEL SELECTING UNIT
603
REFERENCE MODEL STORING UNIT
REFERENCE MODEL623
607
SPECIFICATION INFORMATION CREATING UNIT
SPECIFICATION INFORMATION 625
606
STANDARD MODEL CREATING UNIT
STANDARD MODEL 622

FIG. 27

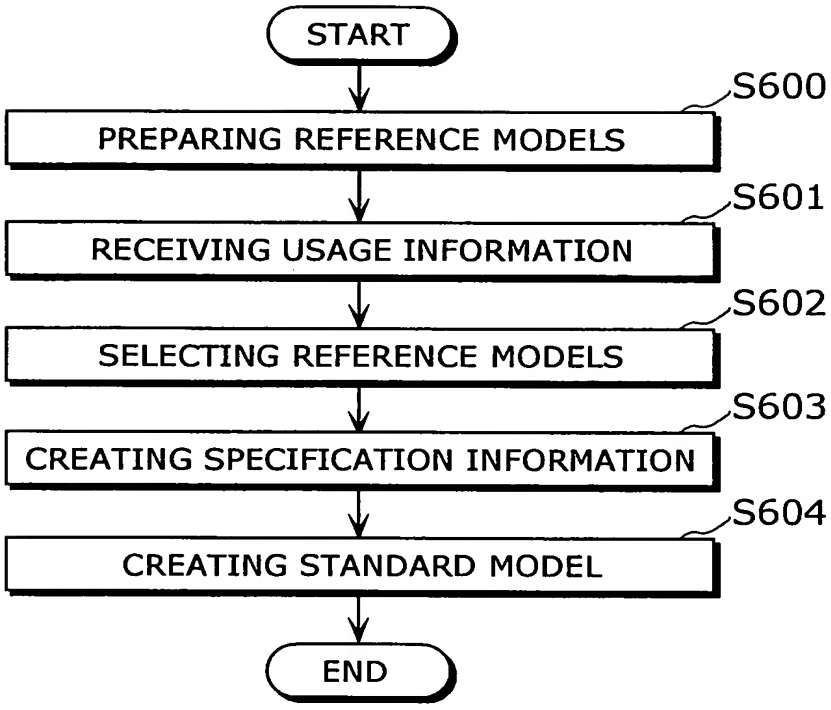
START
S600
PREPARING REFERENCE MODELS
S601
RECEIVING USAGE INFORMATION
S602
SELECTING REFERENCE MODELS
S603
CREATING SPECIFICATION INFORMATION
S604
CREATING STANDARD MODEL
END

FIG. 28

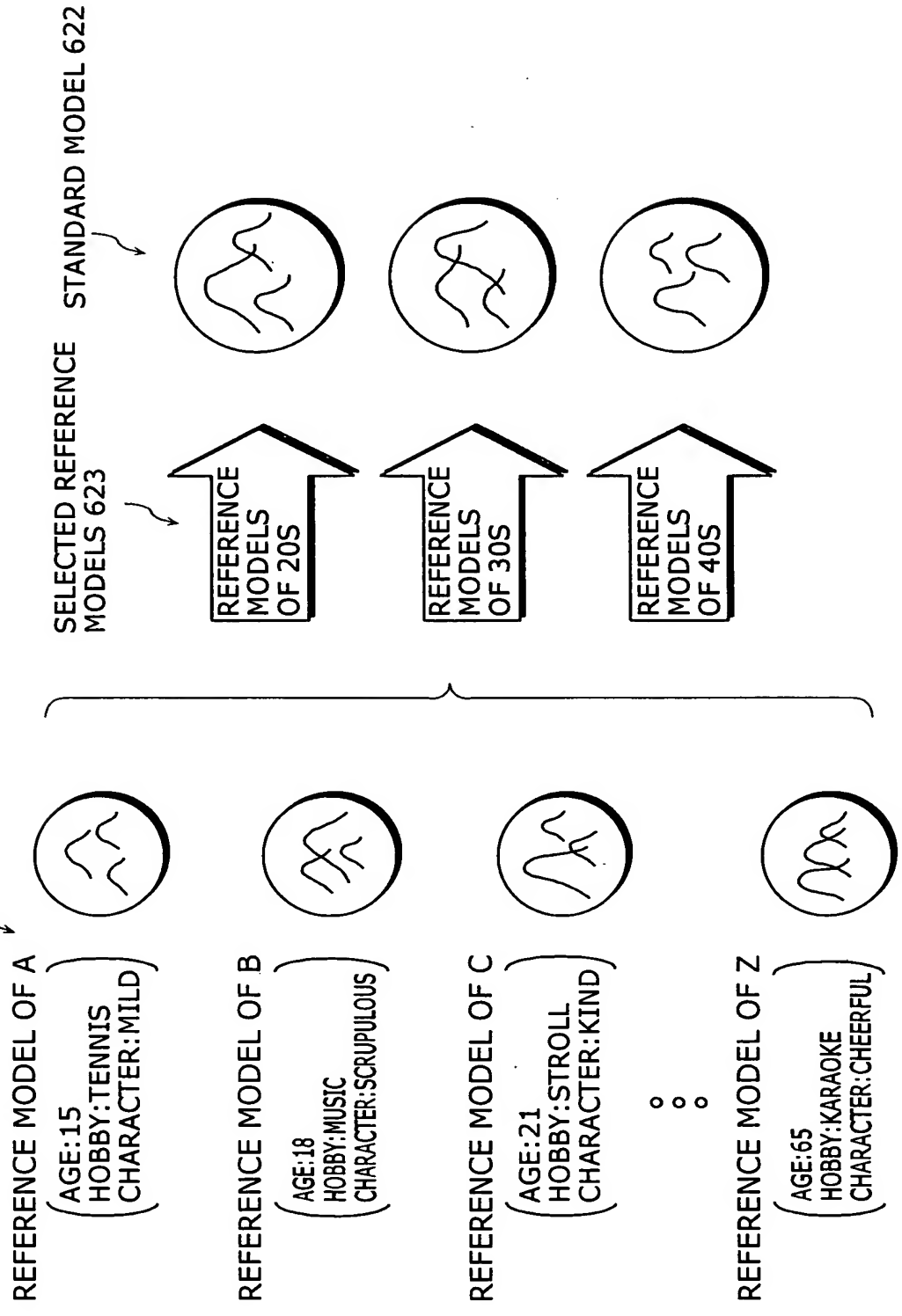
REFERENCE MODELS 621
REFERENCE MODEL OF A
AGE:15
HOBBY:TENNIS
CHARACTER:MILD
REFERENCE MODEL OF B
AGE:18
HOBBY:MUSIC
CHARACTER:SCRUPULOUS
REFERENCE MODEL OF C
AGE:21
HOBBY:STROLL
CHARACTER:KIND
REFERENCE MODEL OF Z
AGE:65
HOBBY:KARAOKE
CHARACTER:CHEERFUL
SELECTED REFERENCE MODELS 623
STANDARD MODEL 622
REFERENCE MODELS OF 20S
REFERENCE MODELS OF 30S
REFERENCE MODELS OF 40S

FIG. 29

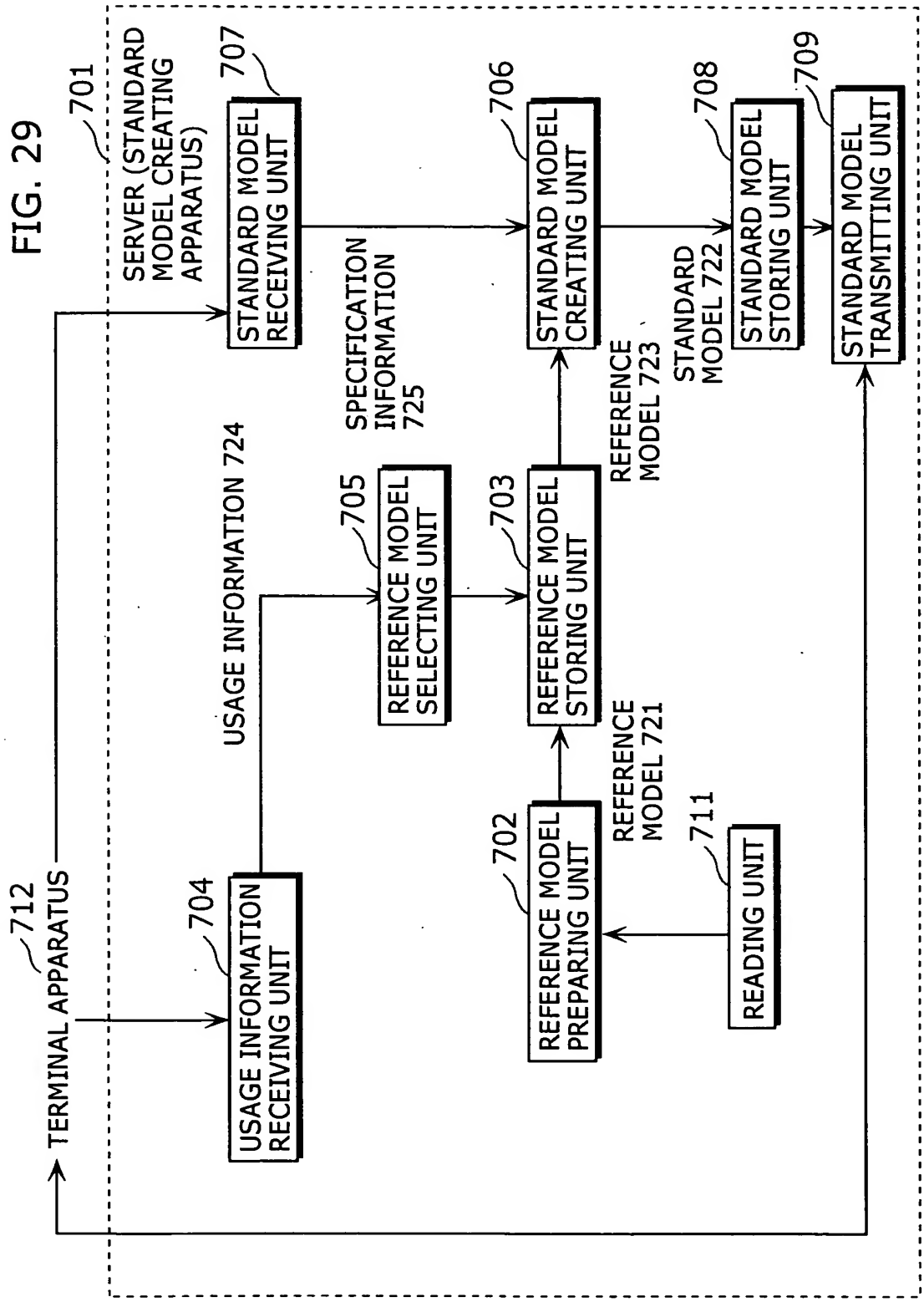
701
SERVER (STANDARD MODEL CREATING APPARATUS)
707
STANDARD MODEL RECEIVING UNIT
706
STANDARD MODEL CREATING UNIT
708
STANDARD MODEL STORING UNIT
709
STANDARD MODEL TRANSMITTING UNIT
SPECIFICATION INFORMATION 725
USAGE INFORMATION 724
705
REFERENCE MODEL SELECTING UNIT
703
REFERENCE MODEL STORING UNIT
REFERENCE MODEL 723
STANDARD MODEL 722
712
TERMINAL APPARATUS
704
USAGE INFORMATION RECEIVING UNIT
702
REFERENCE MODEL PREPARING UNIT
REFERENCE MODEL 721
711
READING UNIT

FIG. 30

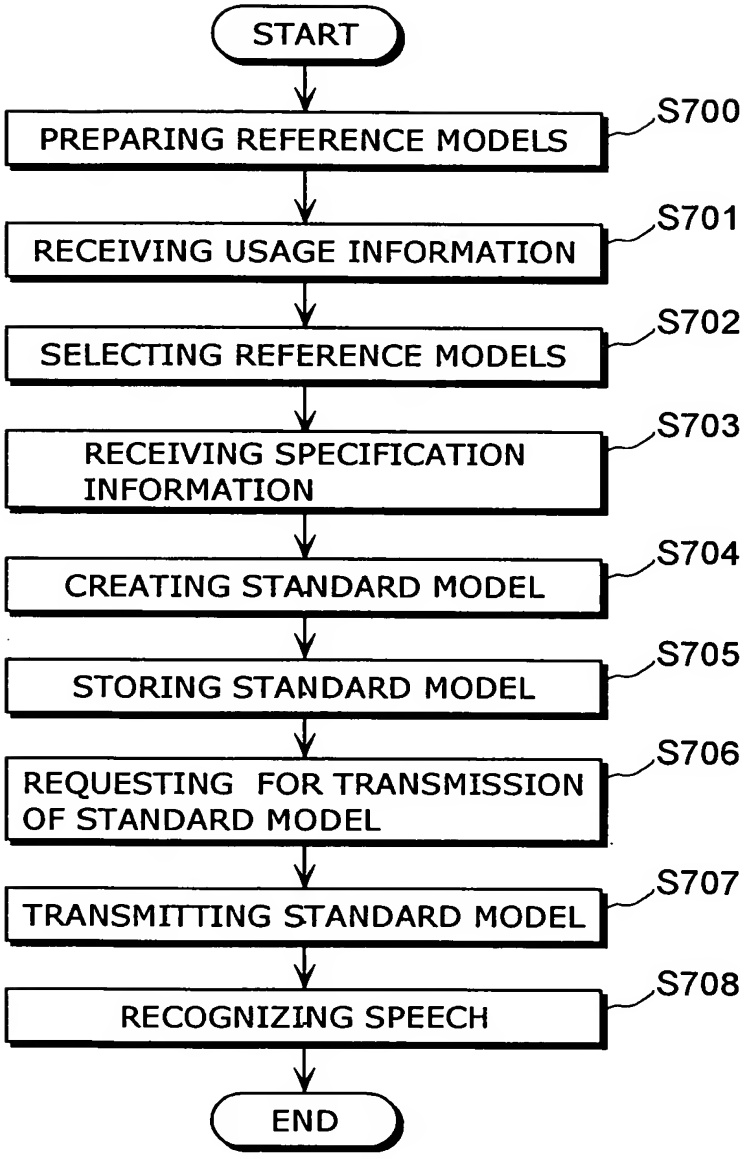
START
PREPARING REFERENCE MODELS
S700
RECEIVING USAGE INFORMATION
S701
SELECTING REFERENCE MODELS
S702
RECEIVING SPECIFICATION INFORMATION
S703
CREATING STANDARD MODEL
S704
STORING STANDARD MODEL
S705
REQUESTING FOR TRANSMISSION OF STANDARD MODEL
S706
TRANSMITTING STANDARD MODEL
S707
RECOGNIZING SPEECH
S708
END

FIG. 31

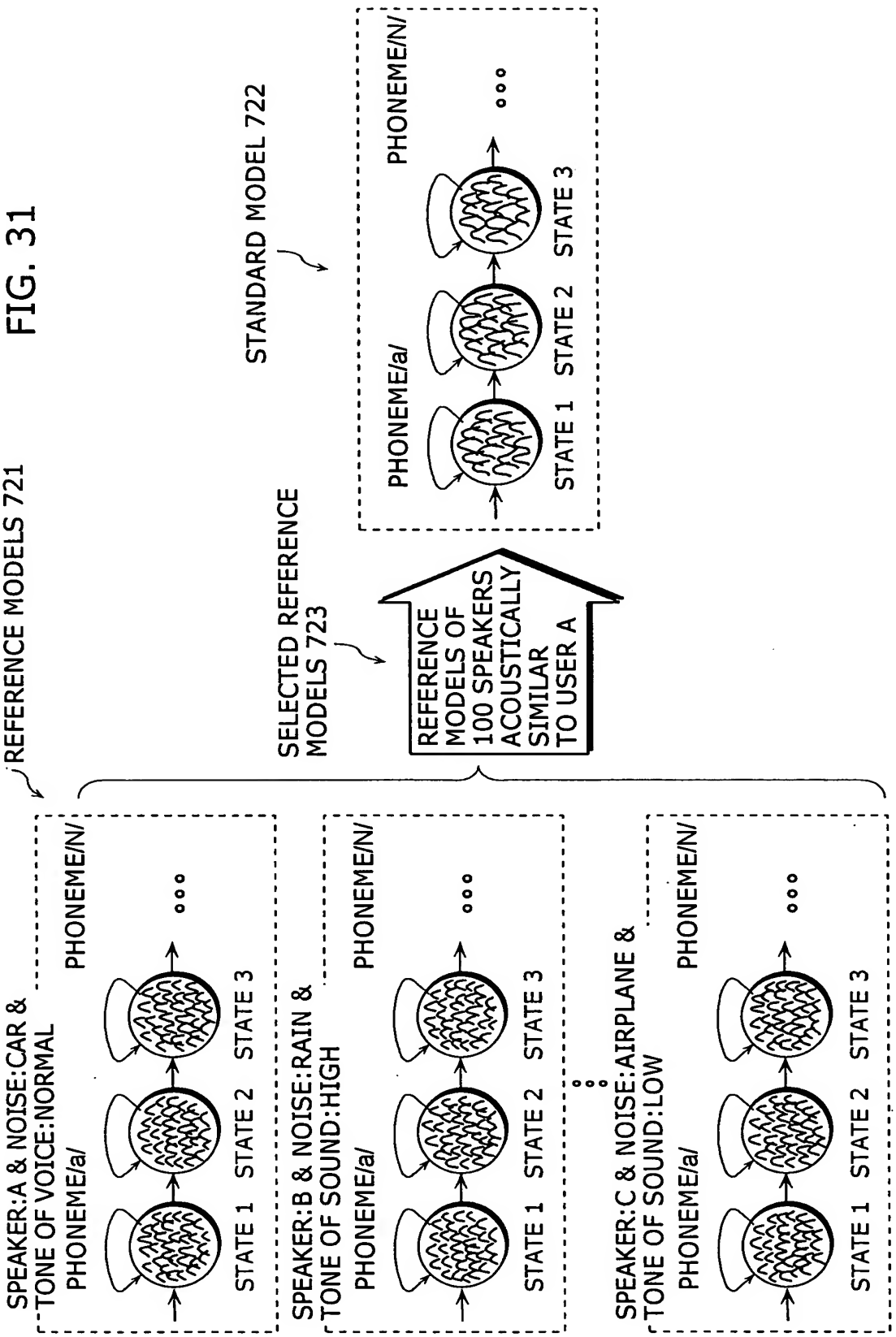
REFERENCE MODELS 721
SPEAKER:A & NOISE:CAR & TONE OF VOICE:NORMAL
PHONEME/a/
PHONEME/N/
STATE 1 STATE 2 STATE 3
SPEAKER:B & NOISE:RAIN & TONE OF SOUND:HIGH
PHONEME/a/
PHONEME/N/
STATE 1 STATE 2 STATE 3
SPEAKER:C & NOISE:AIRPLANE & TONE OF SOUND:LOW
PHONEME/a/
PHONEME/N/
STATE 1 STATE 2 STATE 3
SELECTED REFERENCE MODELS 723
REFERENCE MODELS OF 100 SPEAKERS ACOUSTICALLY SIMILAR TO USER A
STANDARD MODEL 722
PHONEME/a/
PHONEME/N/
STATE 1 STATE 2 STATE 3

FIG. 32

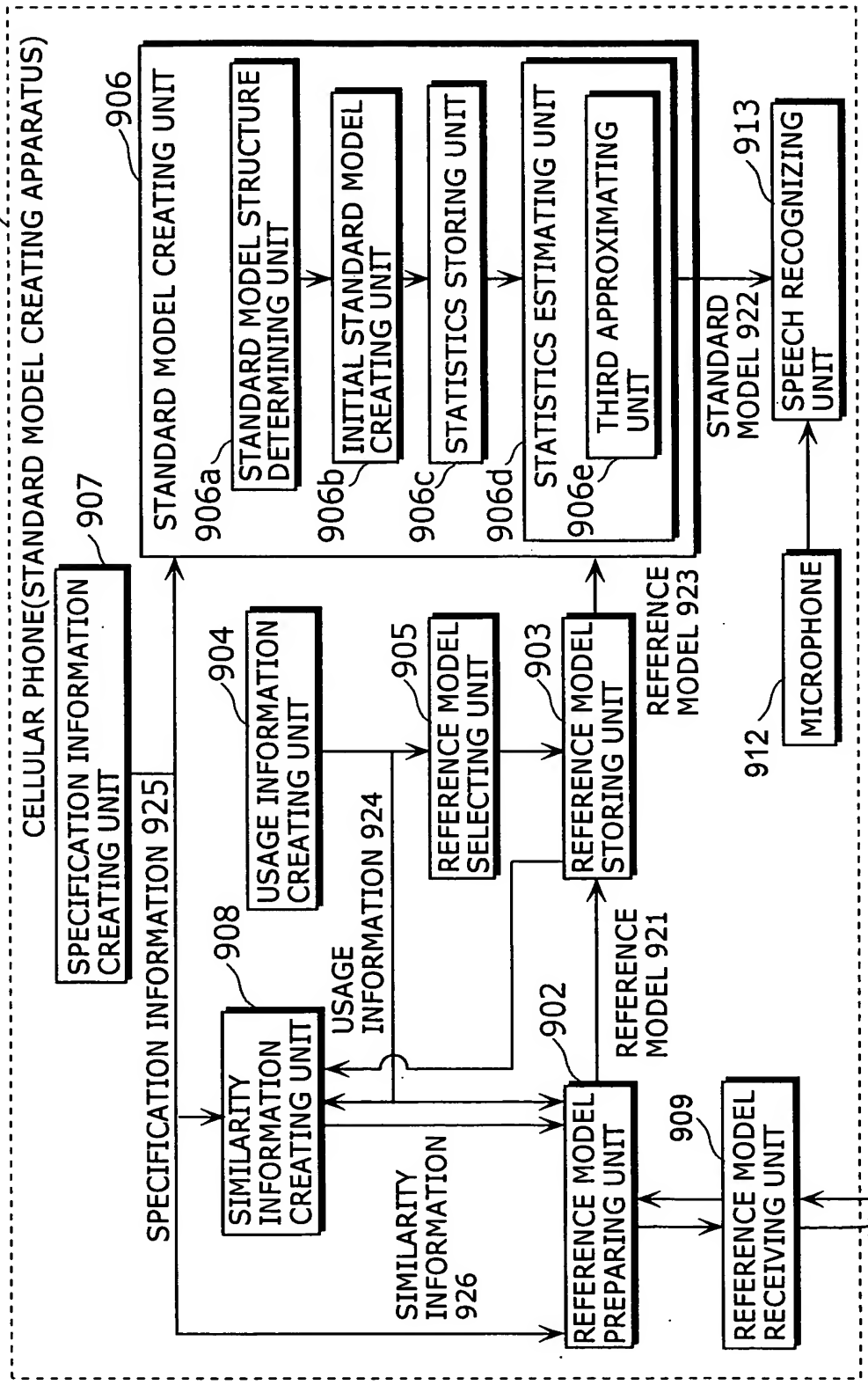
901
CELLULAR PHONE(STANDARD MODEL CREATING APPARATUS)
906
STANDARD MODEL CREATING UNIT
906a
STANDARD MODEL STRUCTURE DETERMINING UNIT
906b
INITIAL STANDARD MODEL CREATING UNIT
906c
STATISTICS STORING UNIT
906d
STATISTICS ESTIMATING UNIT
906e
THIRD APPROXIMATING UNIT
907
SPECIFICATION INFORMATION CREATING UNIT
SPECIFICATION INFORMATION 925
904
USAGE INFORMATION CREATING UNIT
905
REFERENCE MODEL SELECTING UNIT
903
REFERENCE MODEL STORING UNIT
REFERENCE MODEL 923
STANDARD MODEL 922
913
SPEECH RECOGNIZING UNIT
912
MICROPHONE
908
SIMILARITY INFORMATION CREATING UNIT
USAGE INFORMATION 924
902
REFERENCE MODEL 921
909
REFERENCE MODEL PREPARING UNIT
REFERENCE MODEL RECEIVING UNIT
SIMILARITY INFORMATION 926
SERVER APPARATUS 910

FIG. 33

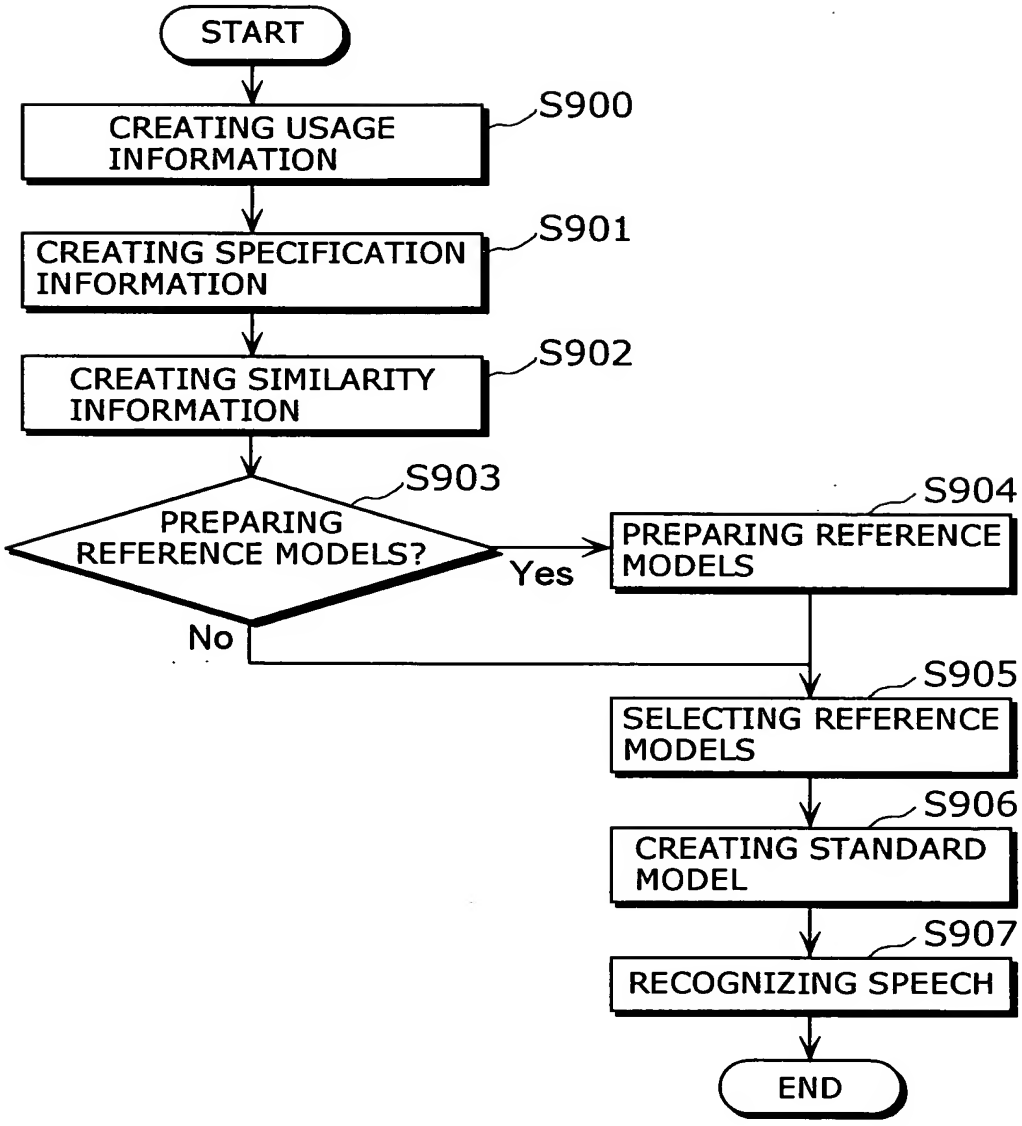
START
CREATING USAGE INFORMATION
S900
CREATING SPECIFICATION INFORMATION
S901
CREATING SIMILARITY INFORMATION
S902
PREPARING REFERENCE MODELS?
S903
Yes
No
PREPARING REFERENCE MODELS
S904
SELECTING REFERENCE MODELS
S905
CREATING STANDARD MODEL
S906
RECOGNIZING SPEECH
S907
END

FIG. 34

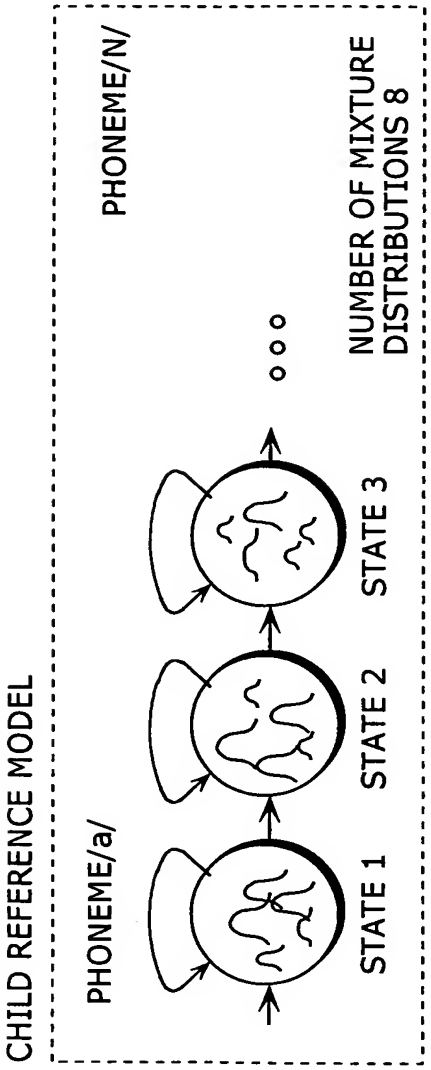
CHILD REFERENCE MODEL
PHONEME/a/
PHONEME/N/
STATE 1
STATE 2
STATE 3
NUMBER OF MIXTURE DISTRIBUTIONS 8
921
MODEL

FIG. 35

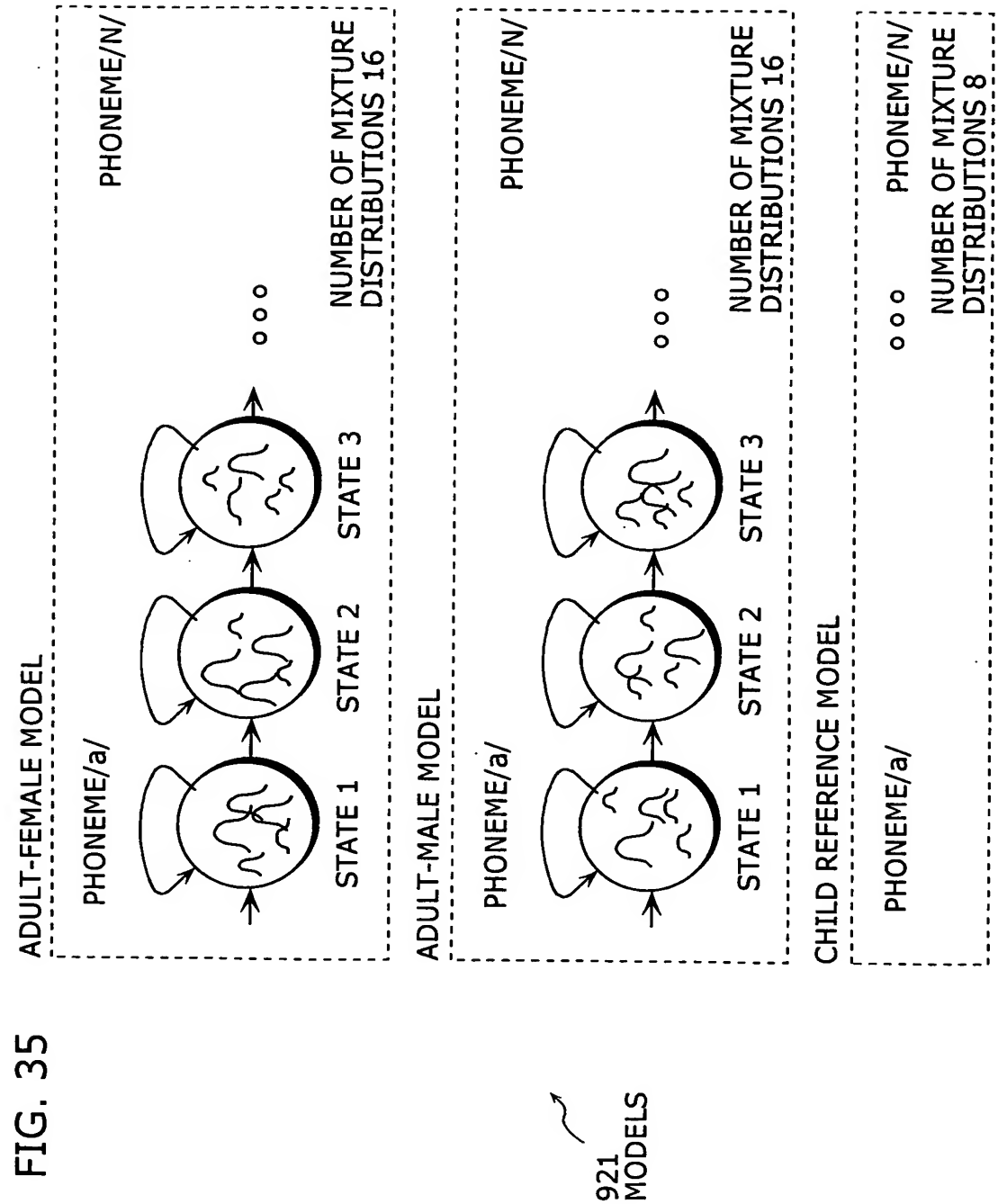
921
MODELS
ADULT-FEMALE MODEL
PHONEME/a/
STATE 1
STATE 2
STATE 3
o o o
PHONEME/N/
NUMBER OF MIXTURE DISTRIBUTIONS 16
ADULT-MALE MODEL
PHONEME/a/
STATE 1
STATE 2
STATE 3
o o o
PHONEME/N/
NUMBER OF MIXTURE DISTRIBUTIONS 16
CHILD REFERENCE MODEL
PHONEME/a/
o o o
PHONEME/N/
NUMBER OF MIXTURE DISTRIBUTIONS 8

FIG. 36A

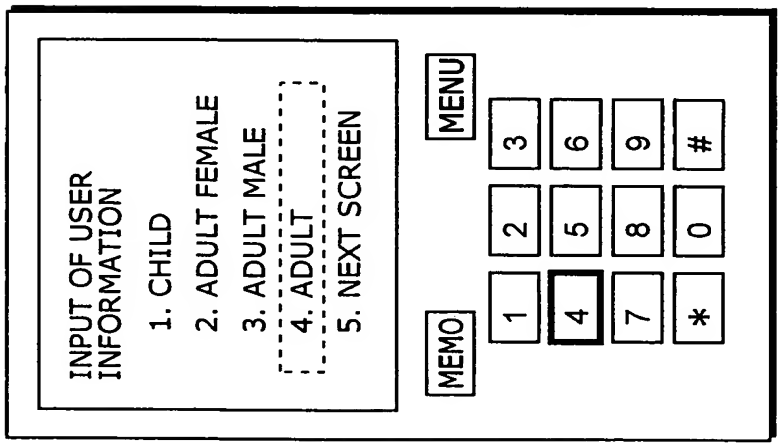

FIG. 36B

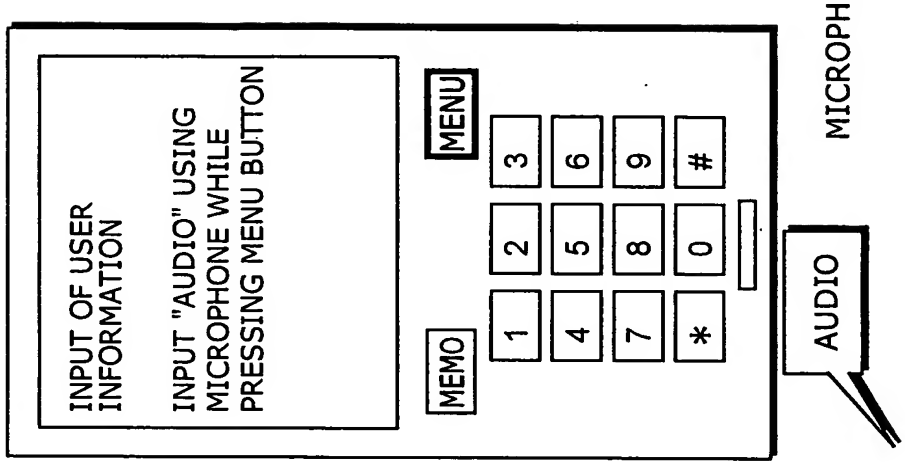

FIG. 37A

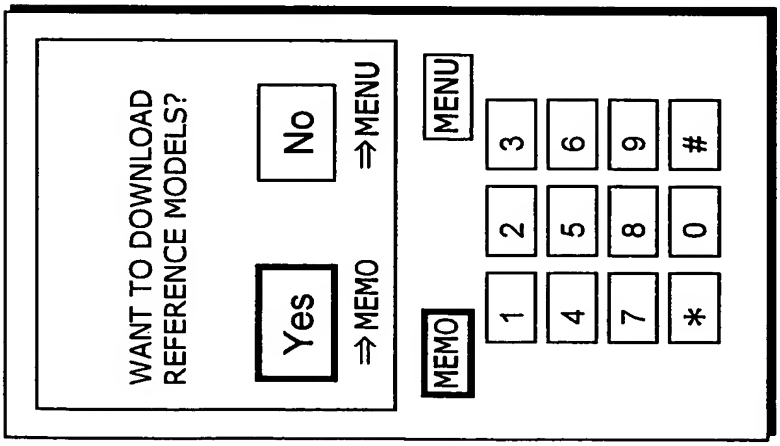

FIG. 37B

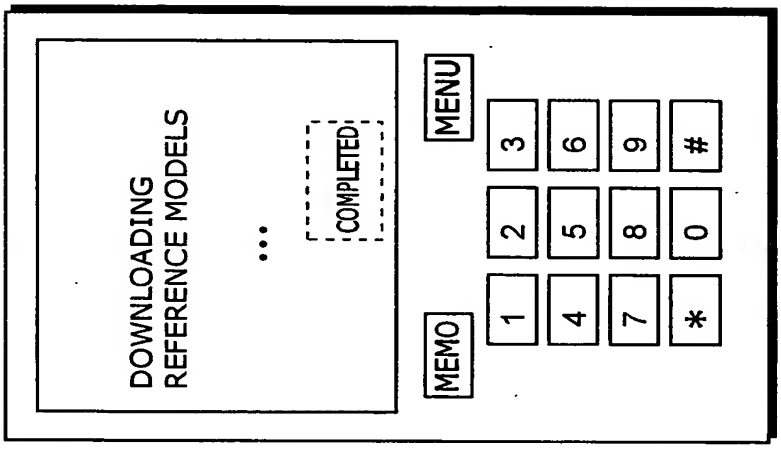

FIG. 38

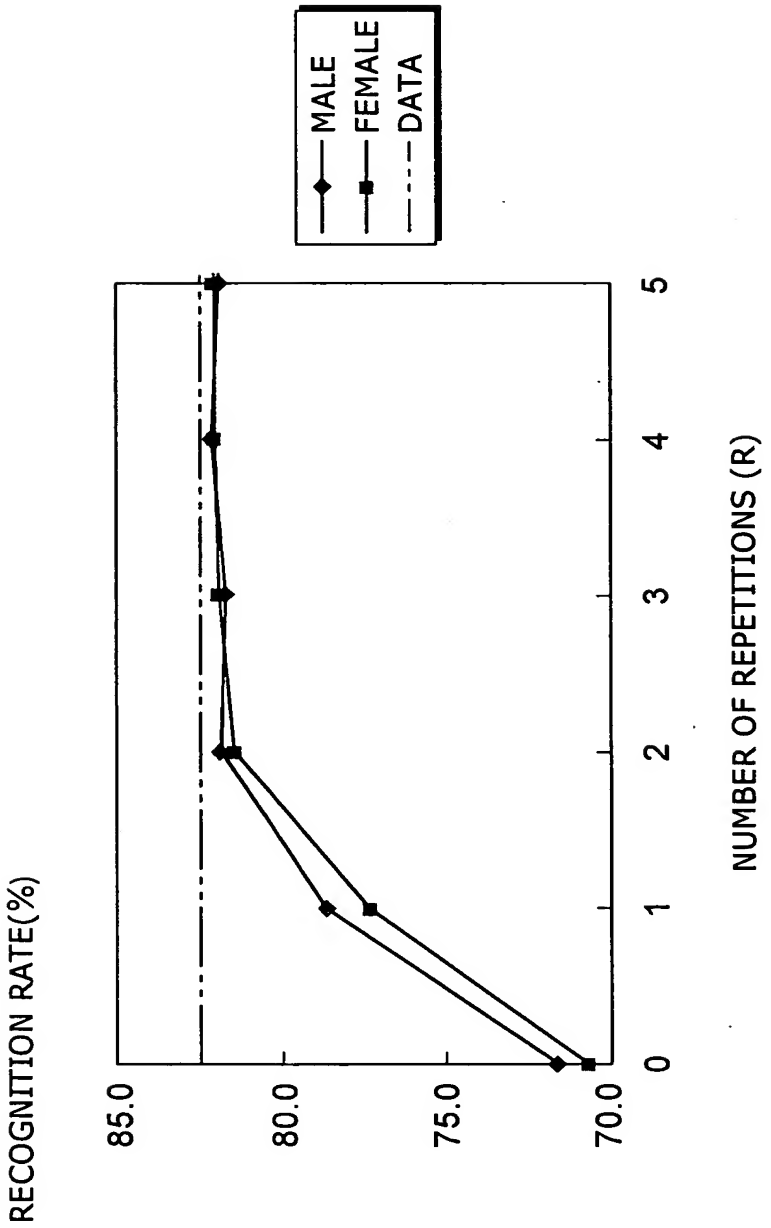
MALE
FEMALE
DATA
RECOGNITION RATE(%)
85.0
80.0
75.0
70.0
0
1
2
3
4
5
NUMBER OF REPETITIONS (R)

FIG. 39

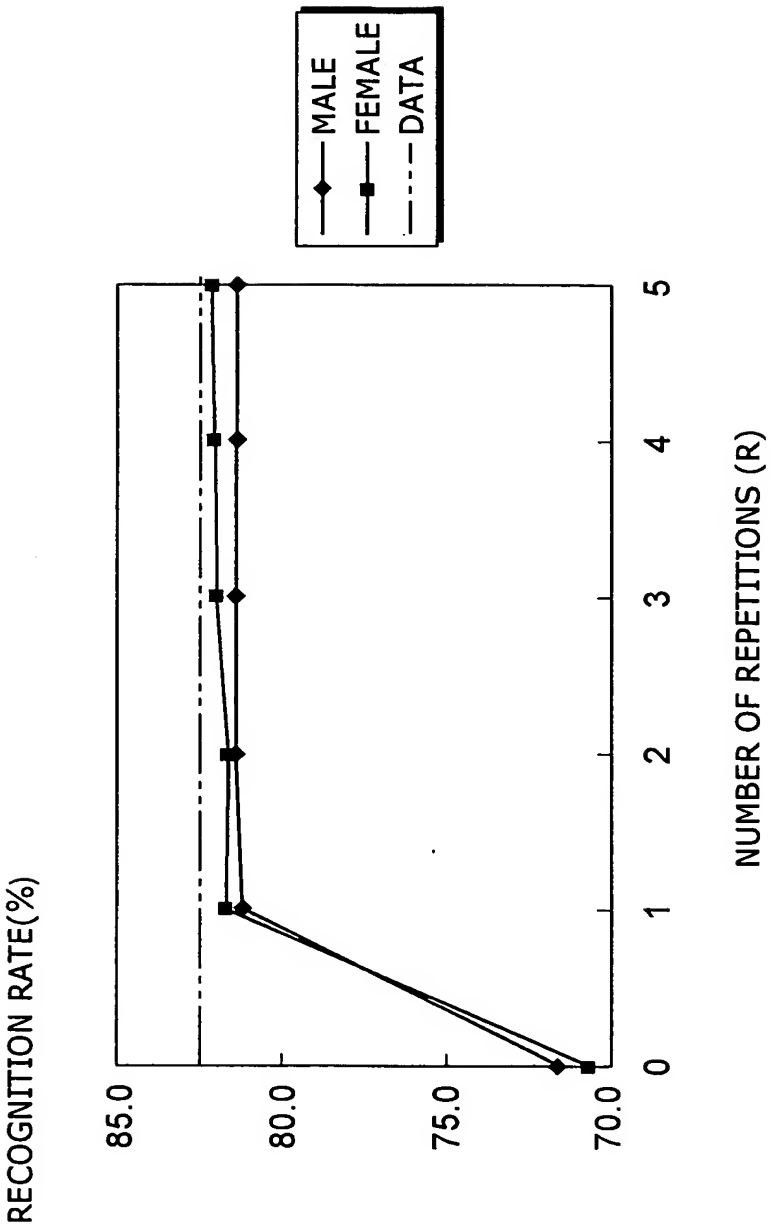
MALE
FEMALE
DATA
RECOGNITION RATE(%)
85.0
80.0
75.0
70.0
0
1
2
3
4
5
NUMBER OF REPETITIONS (R)

FIG. 40

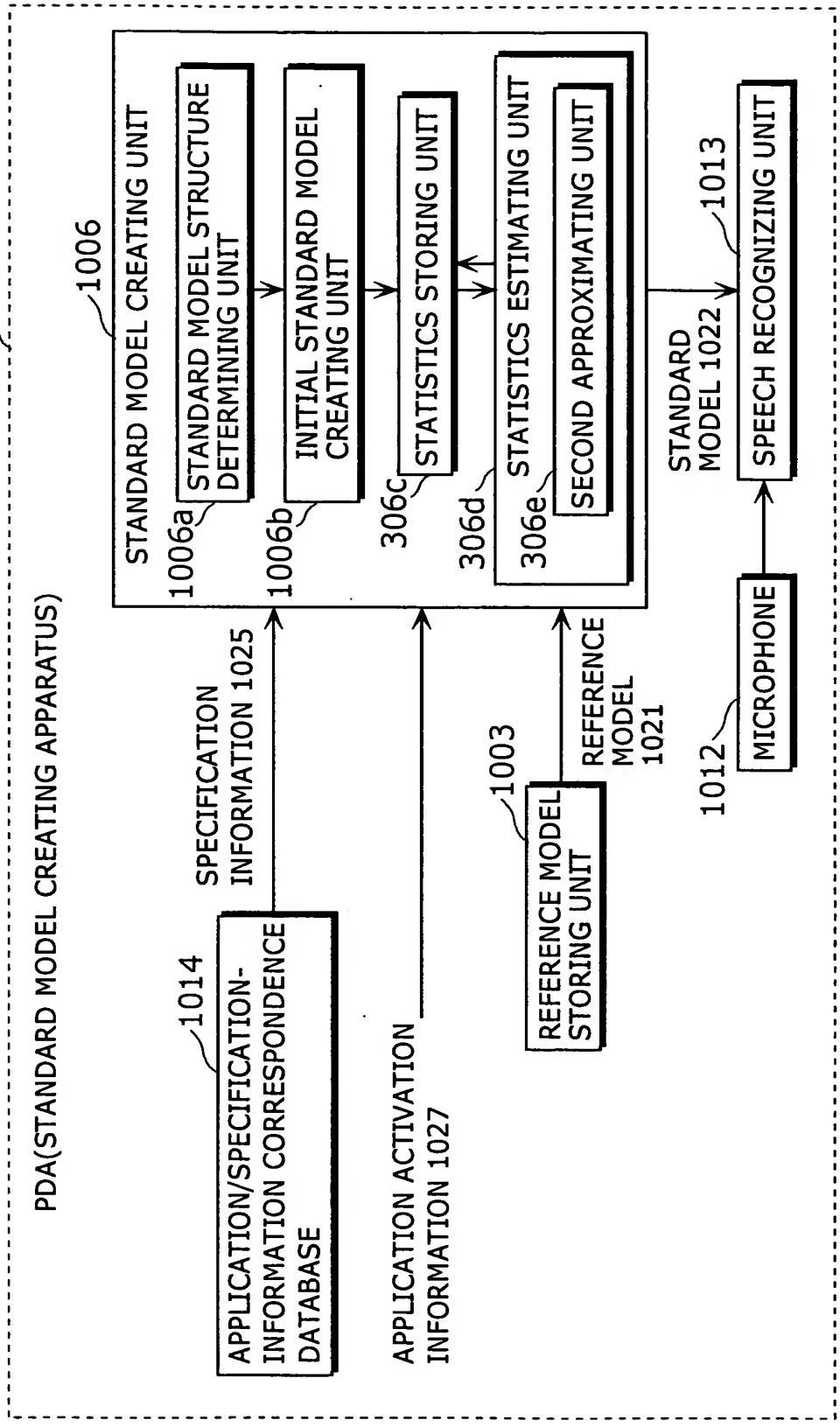
1001
PDA(STANDARD MODEL CREATING APPARATUS)
1006
STANDARD MODEL CREATING UNIT
1006a
STANDARD MODEL STRUCTURE DETERMINING UNIT
1006b
INITIAL STANDARD MODEL CREATING UNIT
306c
STATISTICS STORING UNIT
306d
STATISTICS ESTIMATING UNIT
306e
SECOND APPROXIMATING UNIT
1013
SPEECH RECOGNIZING UNIT
STANDARD MODEL 1022
1012
MICROPHONE
1003
REFERENCE MODEL STORING UNIT
REFERENCE MODEL 1021
1014
APPLICATION/SPECIFICATION-INFORMATION CORRESPONDENCE DATABASE
SPECIFICATION INFORMATION 1025
APPLICATION ACTIVATION INFORMATION 1027

FIG. 41

APPLICATION		SPECIFICATION INFORMATION
ID	NAME	
1	GAME A	NUMBER OF MIXTURE DISTRIBUTIONS 3
2	GAME B	NUMBER OF MIXTURE DISTRIBUTIONS 5
3	STOCK MARKET	NUMBER OF MIXTURE DISTRIBUTIONS 126
4	TV REMOTE CONTROL	NUMBER OF MIXTURE DISTRIBUTIONS 5
5	TRANSLATION	NUMBER OF MIXTURE DISTRIBUTIONS 64

FIG. 42

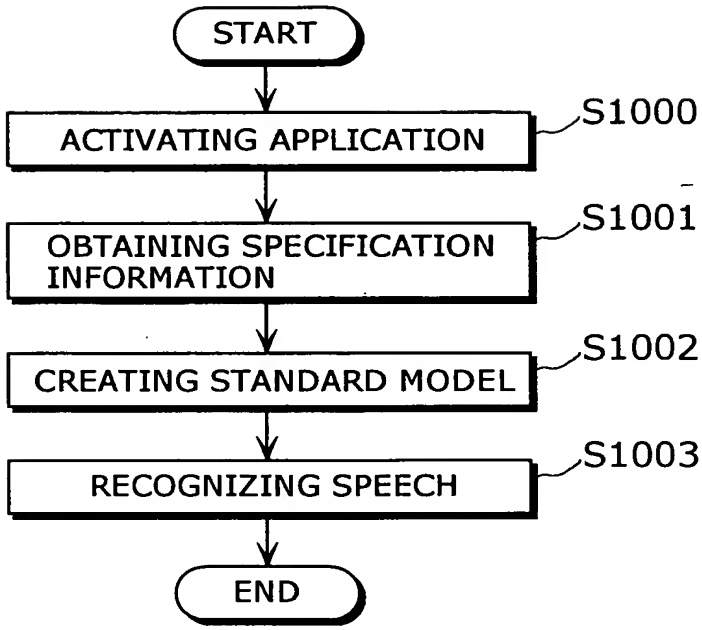
START
ACTIVATING APPLICATION
S1000
OBTAINING SPECIFICATION INFORMATION
S1001
CREATING STANDARD MODEL
S1002
RECOGNIZING SPEECH
S1003
END

FIG. 43

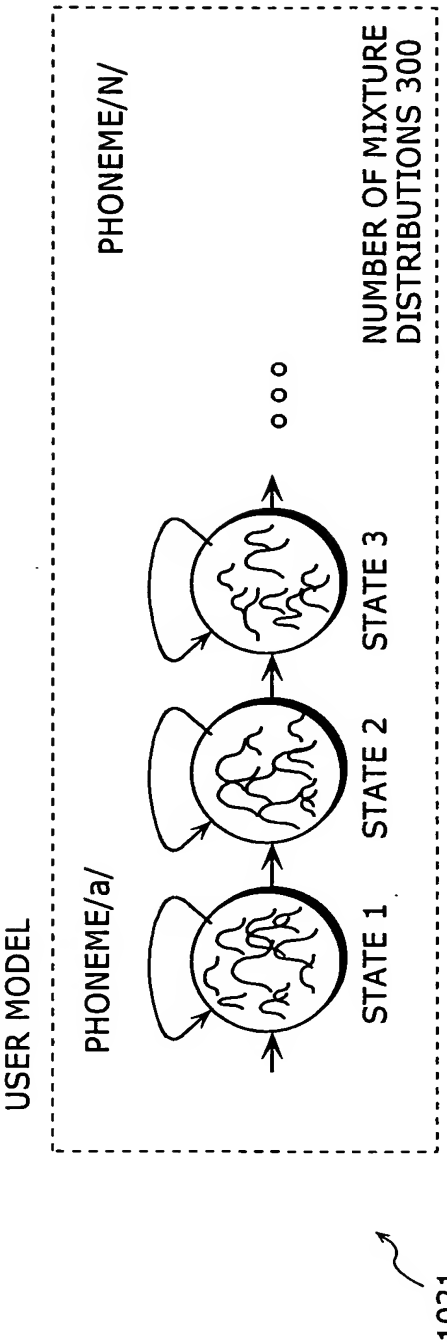
USER MODEL
PHONEME/a/
PHONEME/N/
STATE 1
STATE 2
STATE 3
NUMBER OF MIXTURE DISTRIBUTIONS 300
1021 MODEL

FIG. 44

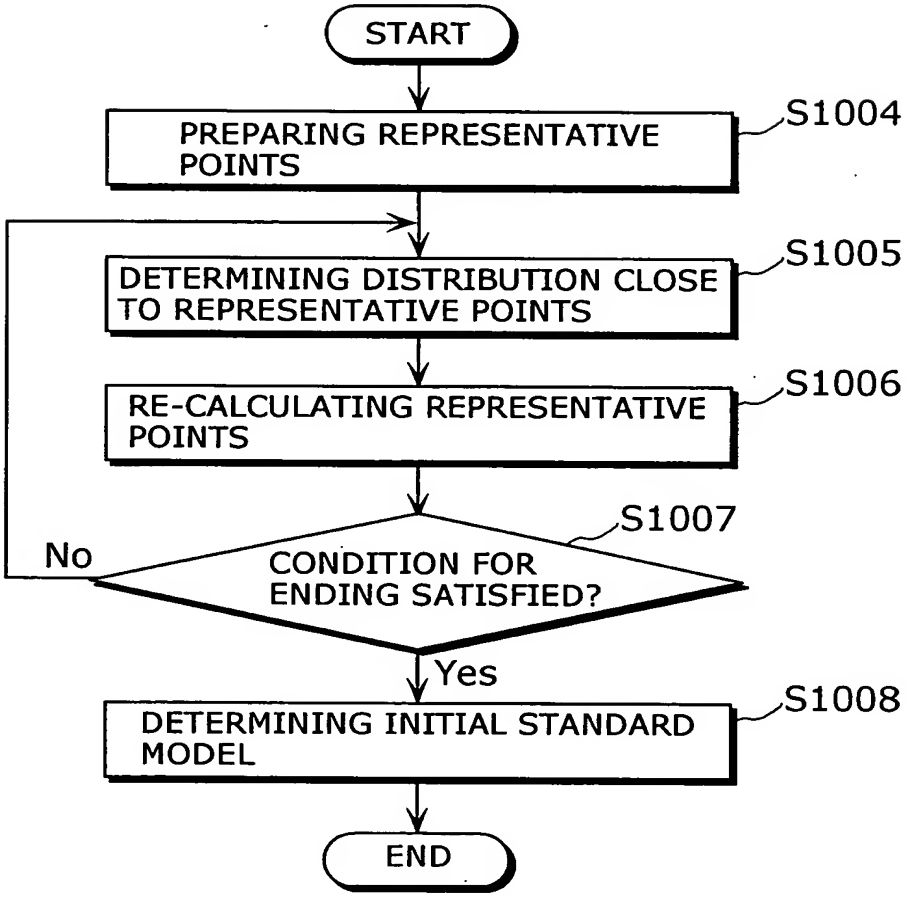
START
PREPARING REPRESENTATIVE POINTS
S1004
DETERMINING DISTRIBUTION CLOSE TO REPRESENTATIVE POINTS
S1005
RE-CALCULATING REPRESENTATIVE POINTS
S1006
CONDITION FOR ENDING SATISFIED?
S1007
No
Yes
DETERMINING INITIAL STANDARD MODEL
S1008
END

FIG. 45

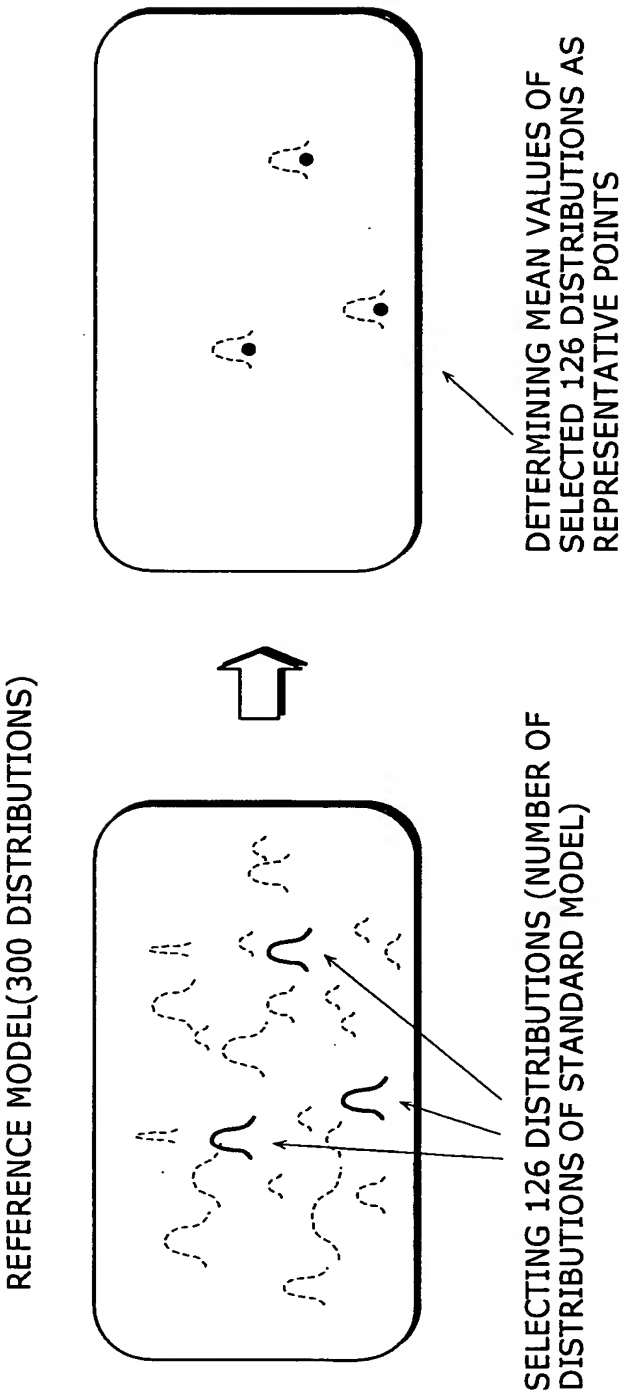
REFERENCE MODEL(300 DISTRIBUTIONS)
SELECTING 126 DISTRIBUTIONS (NUMBER OF DISTRIBUTIONS OF STANDARD MODEL)
DETERMINING MEAN VALUES OF SELECTED 126 DISTRIBUTIONS AS REPRESENTATIVE POINTS

FIG. 46

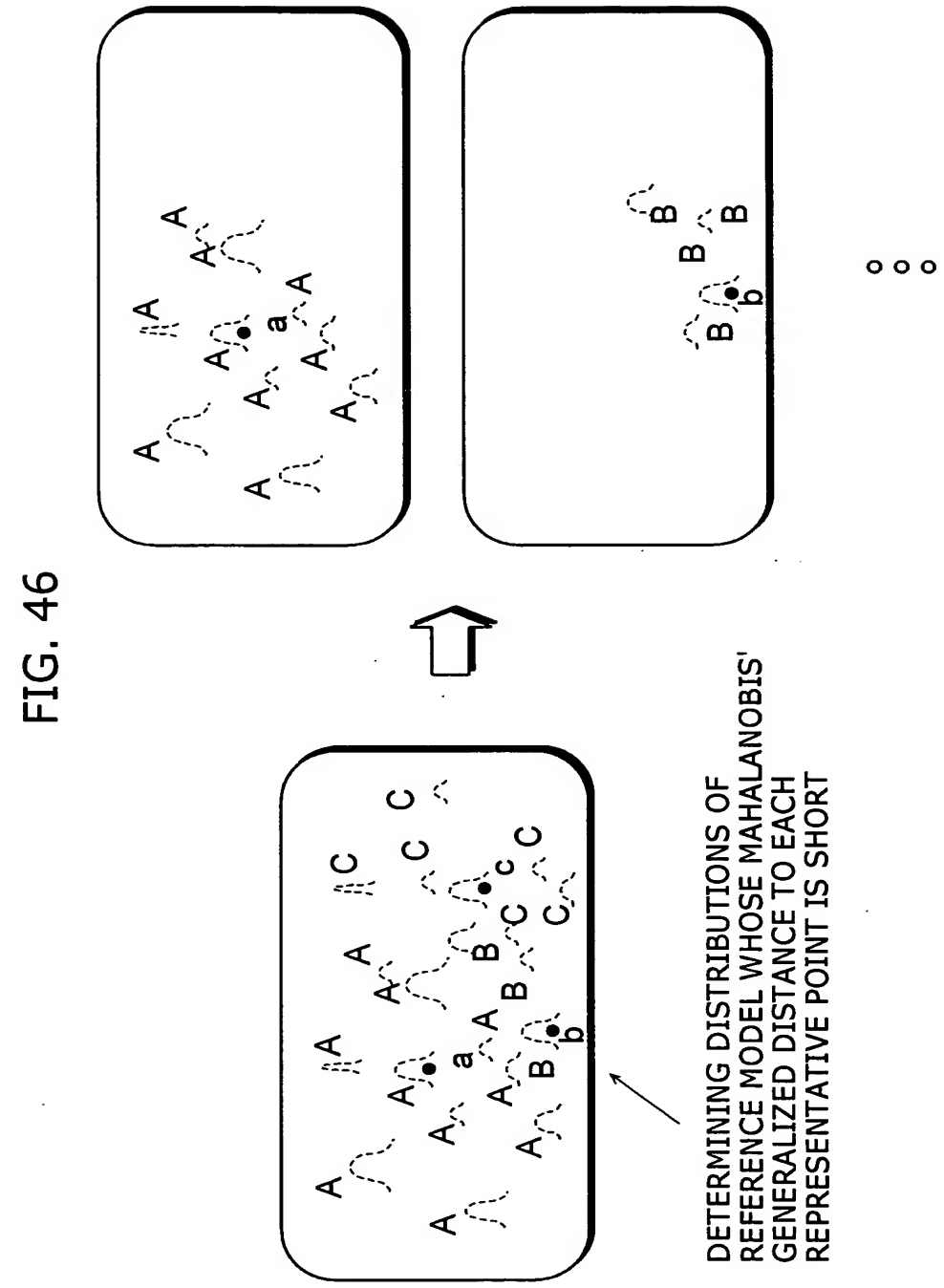
DETERMINING DISTRIBUTIONS OF REFERENCE MODEL WHOSE MAHALANOBIS' GENERALIZED DISTANCE TO EACH REPRESENTATIVE POINT IS SHORT

FIG. 47

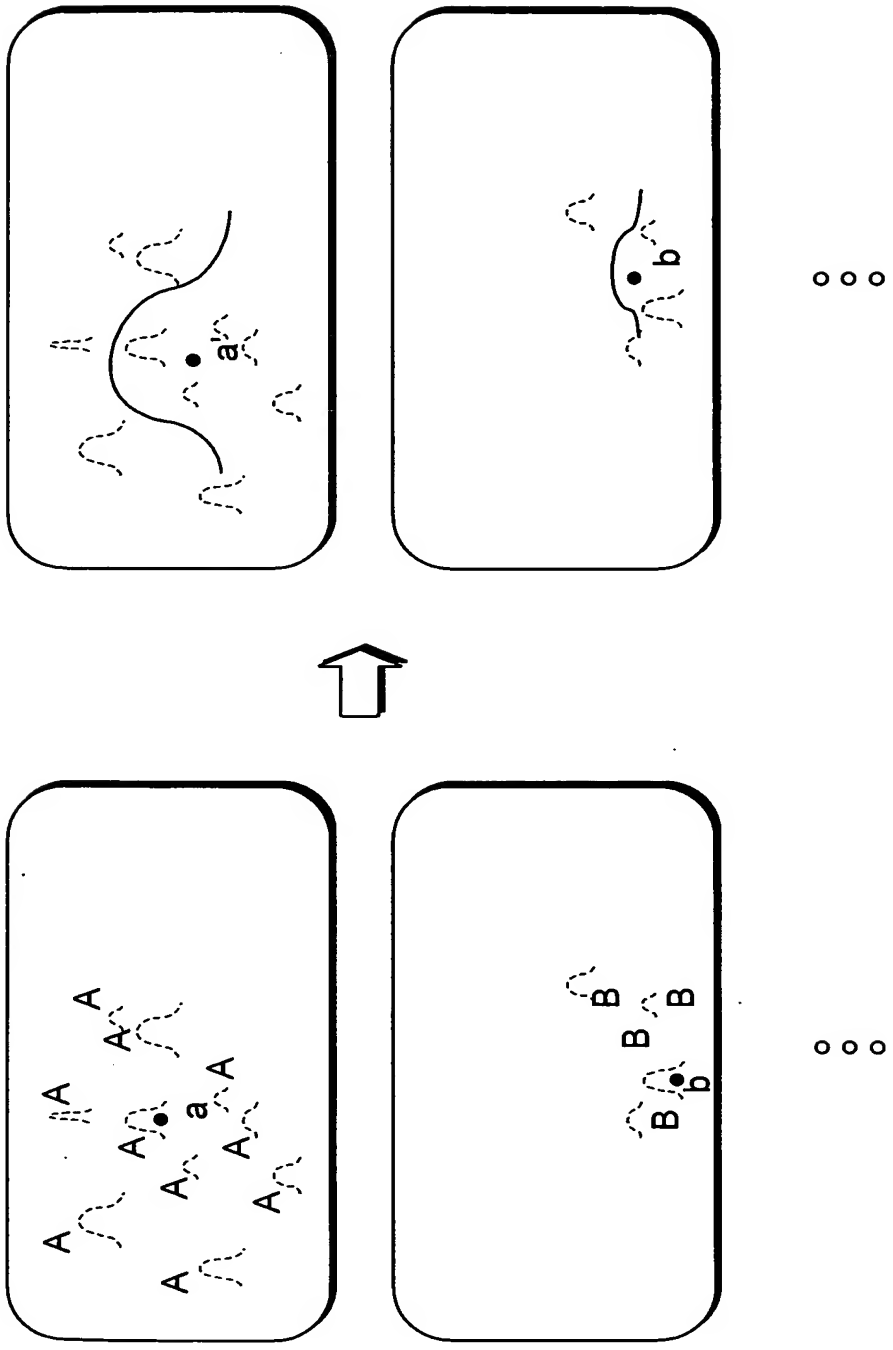

FIG. 48

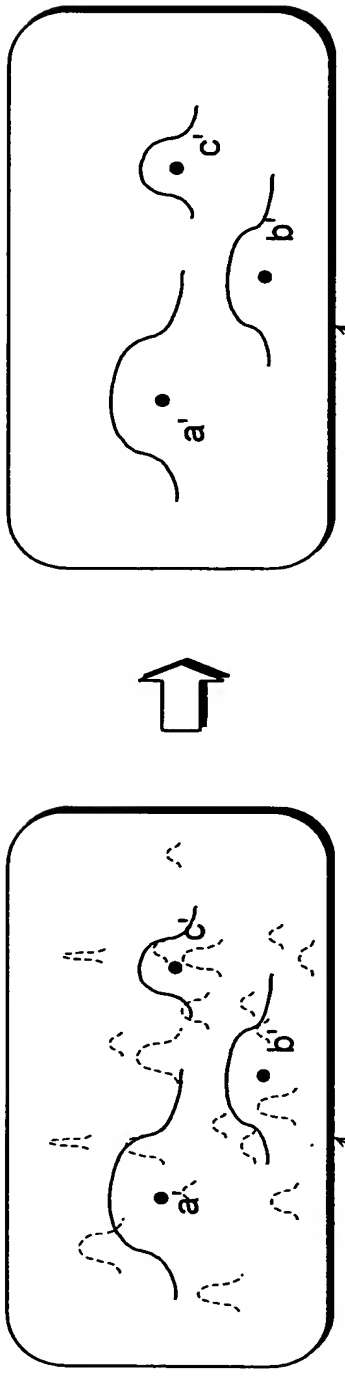
a'
b'
c'
DETERMINING INITIAL STANDARD MODEL (126 DISTRIBUTIONS)
CREATING NEW DISTRIBUTIONS USING DISTRIBUTIONS OF REFERENCE MODEL WHOSE MAHALANOBIS' GENERALIZED DISTANCE TO EACH REPRESENTATIVE POINT IS SHORT

FIG. 49

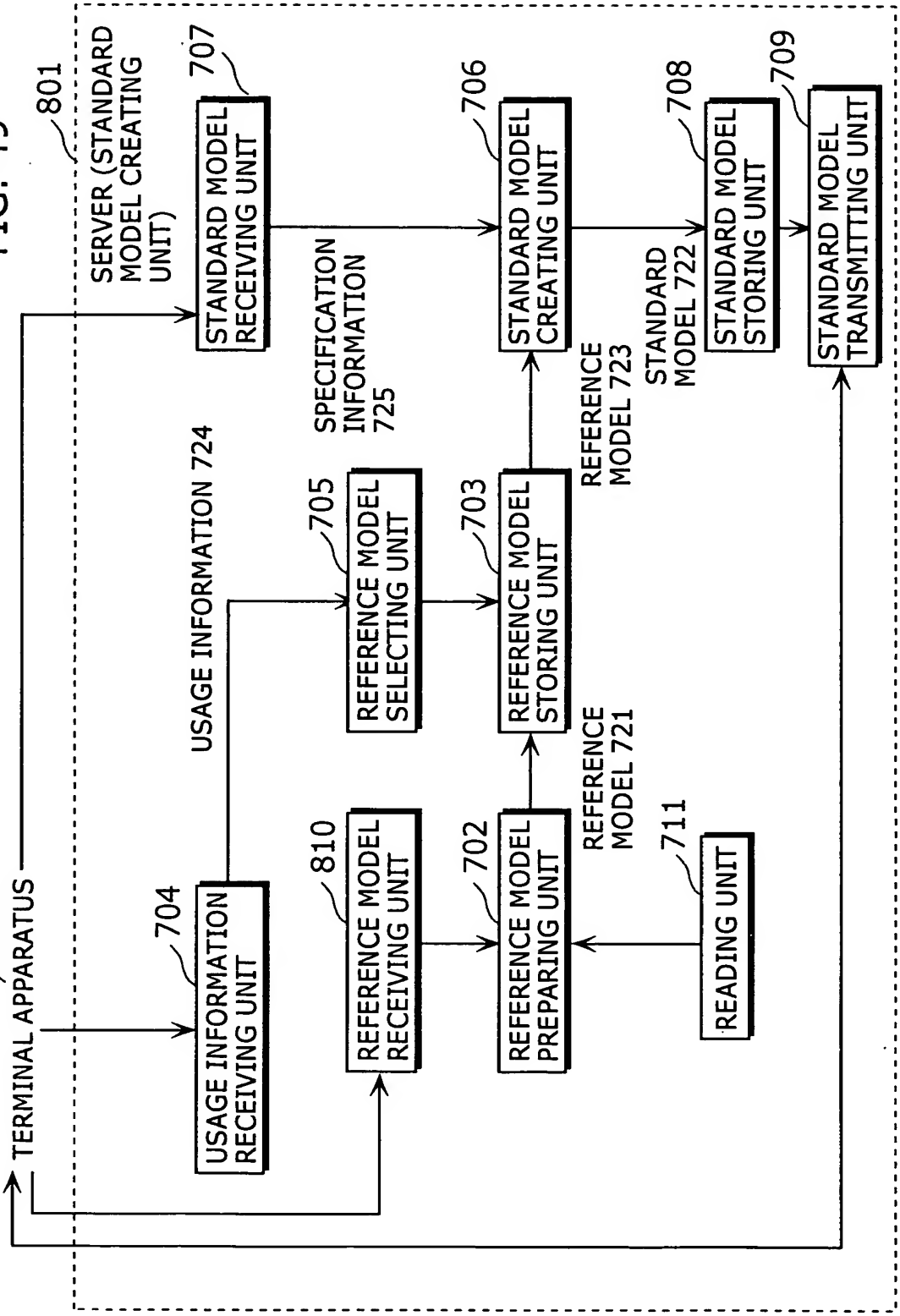
801
SERVER (STANDARD MODEL CREATING UNIT)
707
STANDARD MODEL RECEIVING UNIT
706
STANDARD MODEL CREATING UNIT
708
STANDARD MODEL STORING UNIT
709
STANDARD MODEL TRANSMITTING UNIT
SPECIFICATION INFORMATION 725
STANDARD MODEL 722
REFERENCE MODEL 723
USAGE INFORMATION 724
705
REFERENCE MODEL SELECTING UNIT
703
REFERENCE MODEL STORING UNIT
712
TERMINAL APPARATUS
704
USAGE INFORMATION RECEIVING UNIT
810
REFERENCE MODEL RECEIVING UNIT
702
REFERENCE MODEL PREPARING UNIT
REFERENCE MODEL 721
711
READING UNIT

FIG. 50

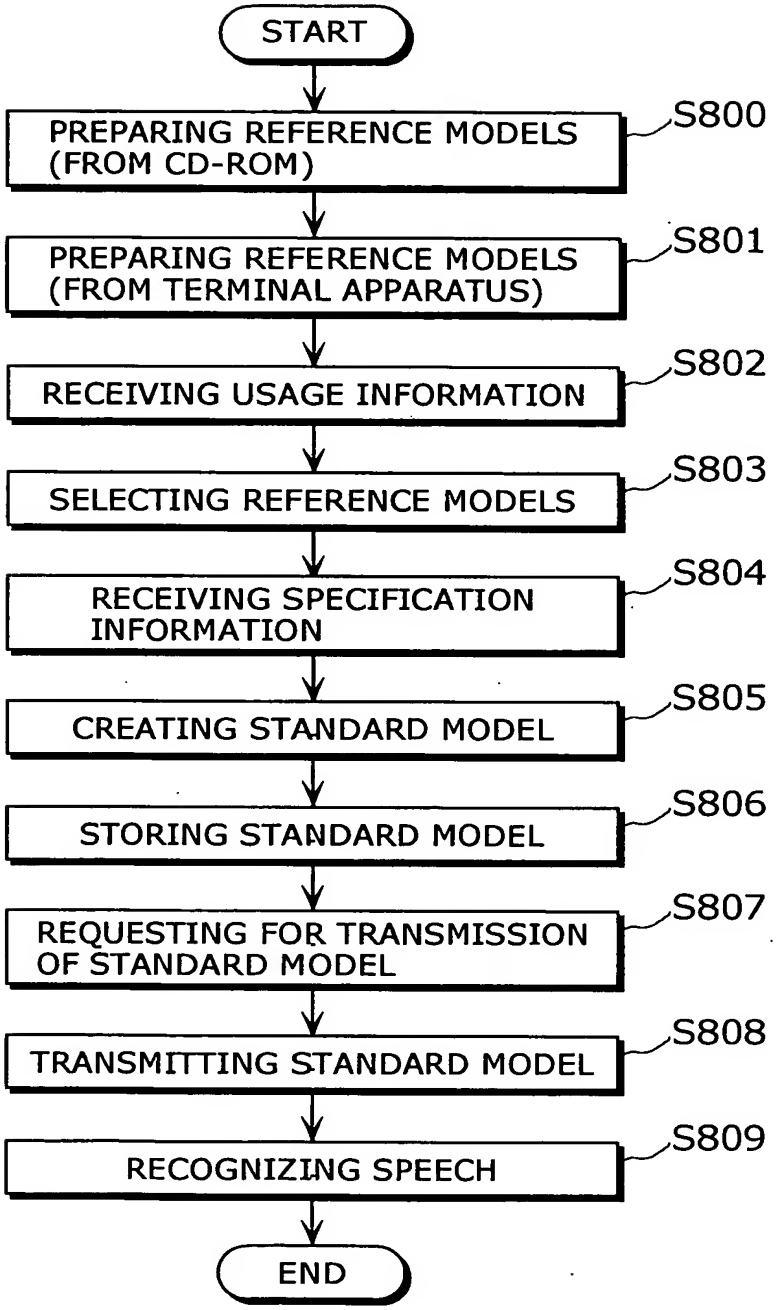
START
PREPARING REFERENCE MODELS (FROM CD-ROM)
S800
PREPARING REFERENCE MODELS (FROM TERMINAL APPARATUS)
S801
RECEIVING USAGE INFORMATION
S802
SELECTING REFERENCE MODELS
S803
RECEIVING SPECIFICATION INFORMATION
S804
CREATING STANDARD MODEL
S805
STORING STANDARD MODEL
S806
REQUESTING FOR TRANSMISSION OF STANDARD MODEL
S807
TRANSMITTING STANDARD MODEL
S808
RECOGNIZING SPEECH
S809
END

FIG. 51

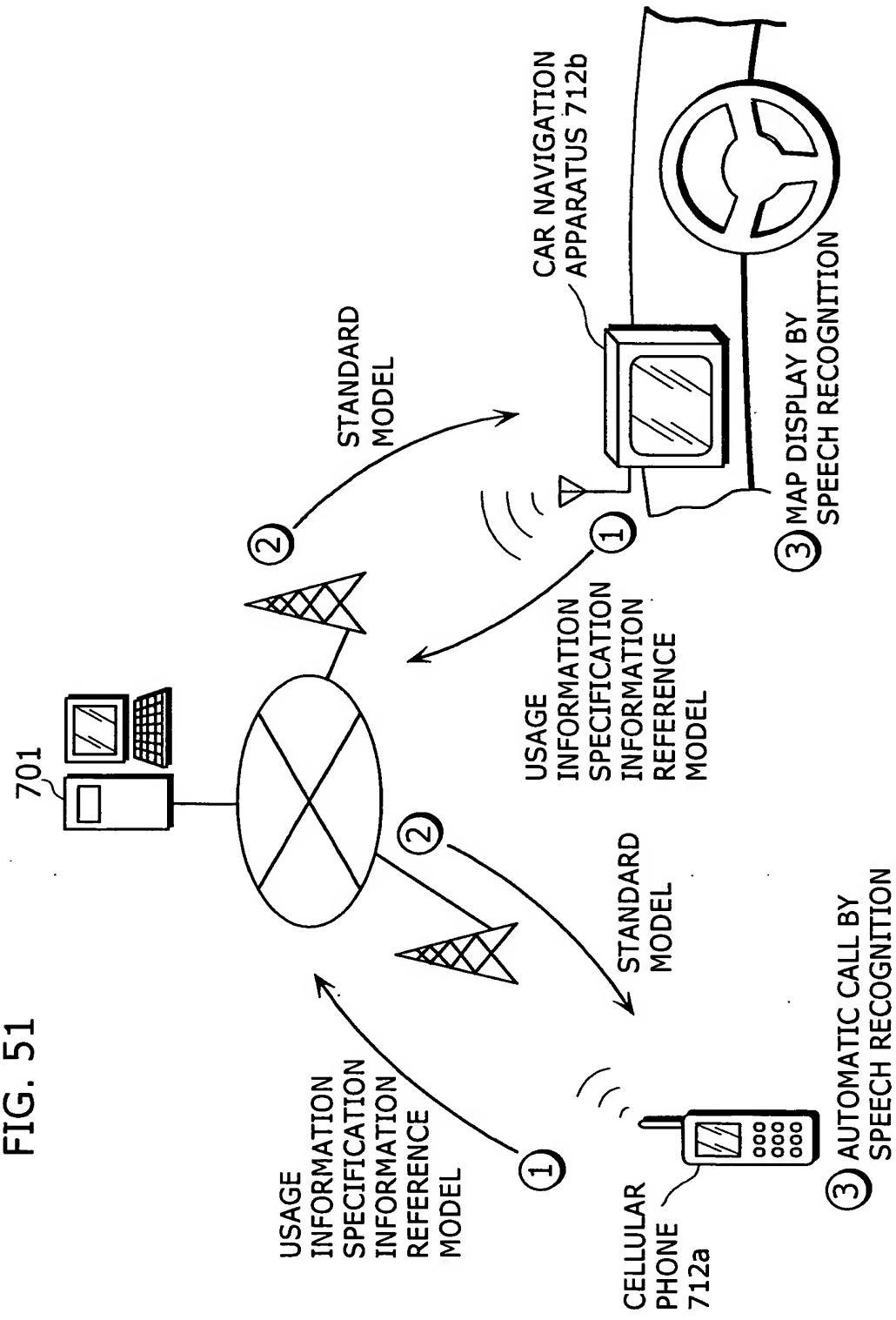
701
USAGE INFORMATION SPECIFICATION INFORMATION REFERENCE MODEL
STANDARD MODEL
CELLULAR PHONE 712a
AUTOMATIC CALL BY SPEECH RECOGNITION
USAGE INFORMATION SPECIFICATION INFORMATION REFERENCE MODEL
STANDARD MODEL
CAR NAVIGATION APPARATUS 712b
MAP DISPLAY BY SPEECH RECOGNITION
1
2
3

FIG. 52

CORRESPONDENCE TABLE AMONG CLASS ID,
INITIAL STANDARD MODEL, AND REFERENCE MODEL

CLASS ID	INITIAL STANDARD MODEL	REFERENCE MODEL
8A	INITIAL STANDARD MODEL 8A	REFERENCE MODEL 8AA
		REFERENCE MODEL 8AB
		REFERENCE MODEL 8AC
		⋮
		REFERENCE MODEL 8AZ
⋮	⋮	⋮
64Z	INITIAL STANDARD MODEL 64Z	REFERENCE MODEL 64ZA
		REFERENCE MODEL 64ZB
		REFERENCE MODEL 64ZC
		⋮
		REFERENCE MODEL 64ZZ

FIG. 53

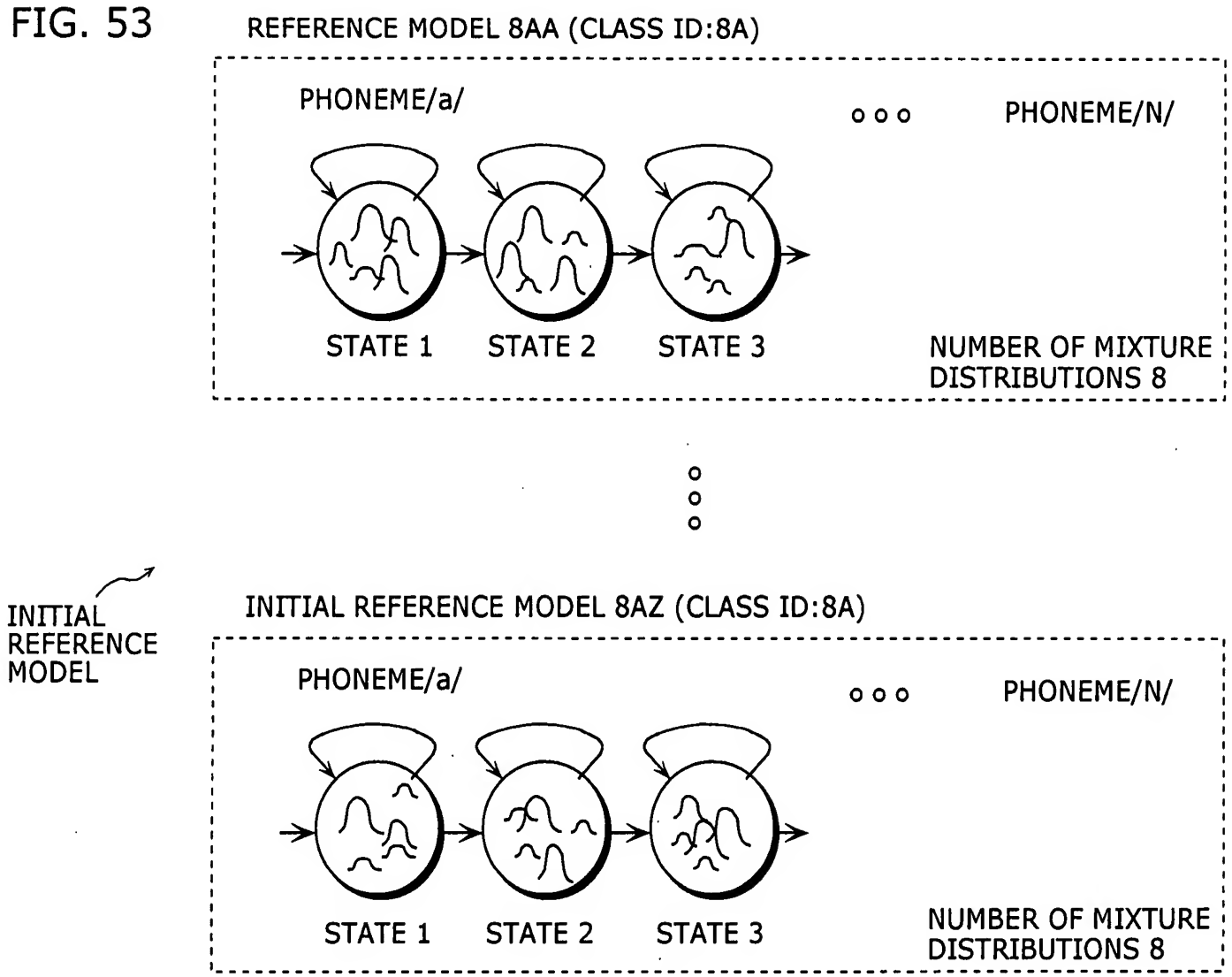
REFERENCE MODEL 8AA (CLASS ID:8A)
PHONEME/a/
o o o
PHONEME/N/
STATE 1
STATE 2
STATE 3
NUMBER OF MIXTURE DISTRIBUTIONS 8
INITIAL REFERENCE MODEL
INITIAL REFERENCE MODEL 8AZ (CLASS ID:8A)
PHONEME/a/
o o o
PHONEME/N/
STATE 1
STATE 2
STATE 3
NUMBER OF MIXTURE DISTRIBUTIONS 8

FIG. 54

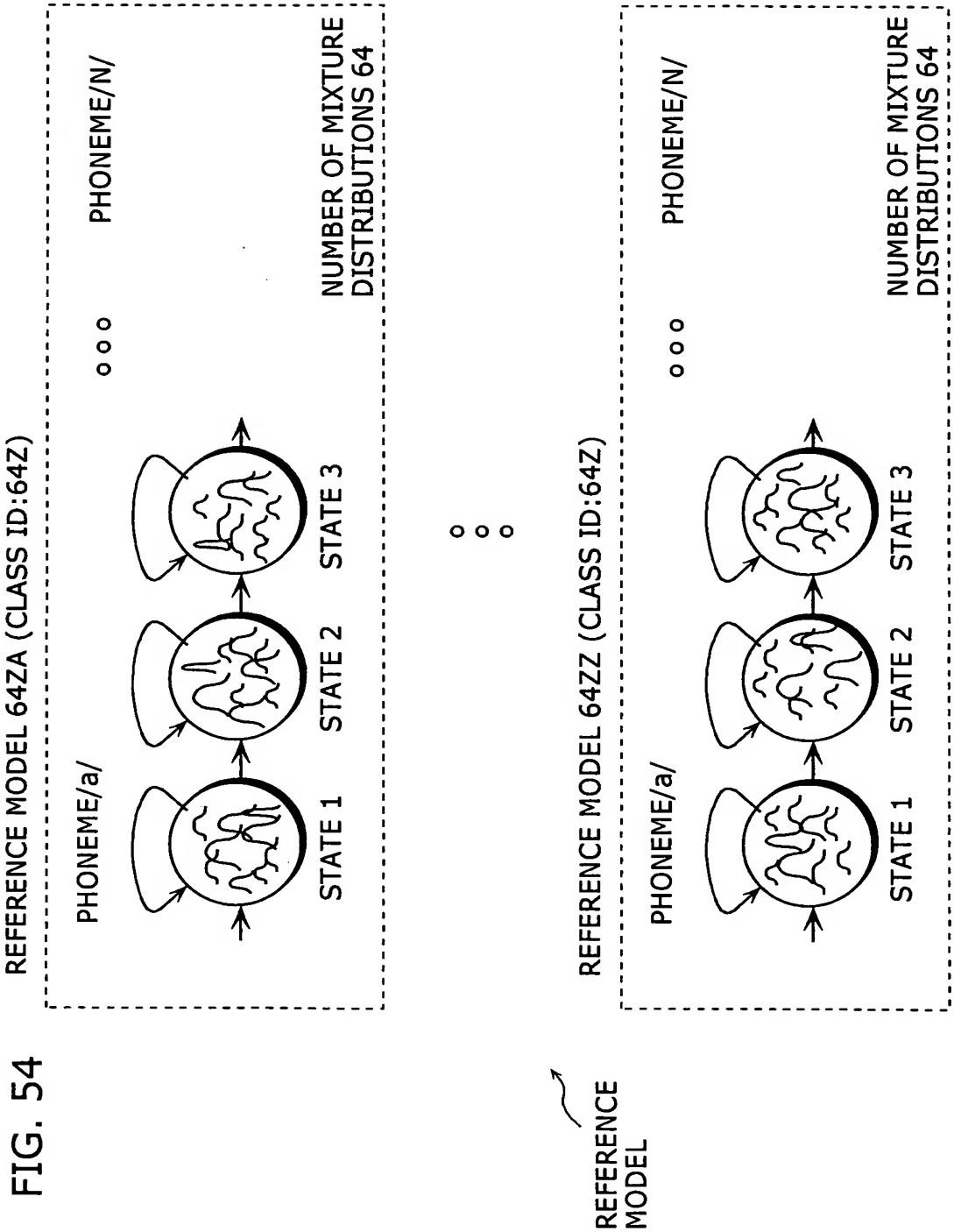
REFERENCE MODEL 64ZA (CLASS ID:64Z)
PHONEME/a/
PHONEME/N/
STATE 1
STATE 2
STATE 3
NUMBER OF MIXTURE DISTRIBUTIONS 64
REFERENCE MODEL 64ZZ (CLASS ID:64Z)
PHONEME/a/
PHONEME/N/
STATE 1
STATE 2
STATE 3
NUMBER OF MIXTURE DISTRIBUTIONS 64
REFERENCE MODEL

FIG. 55

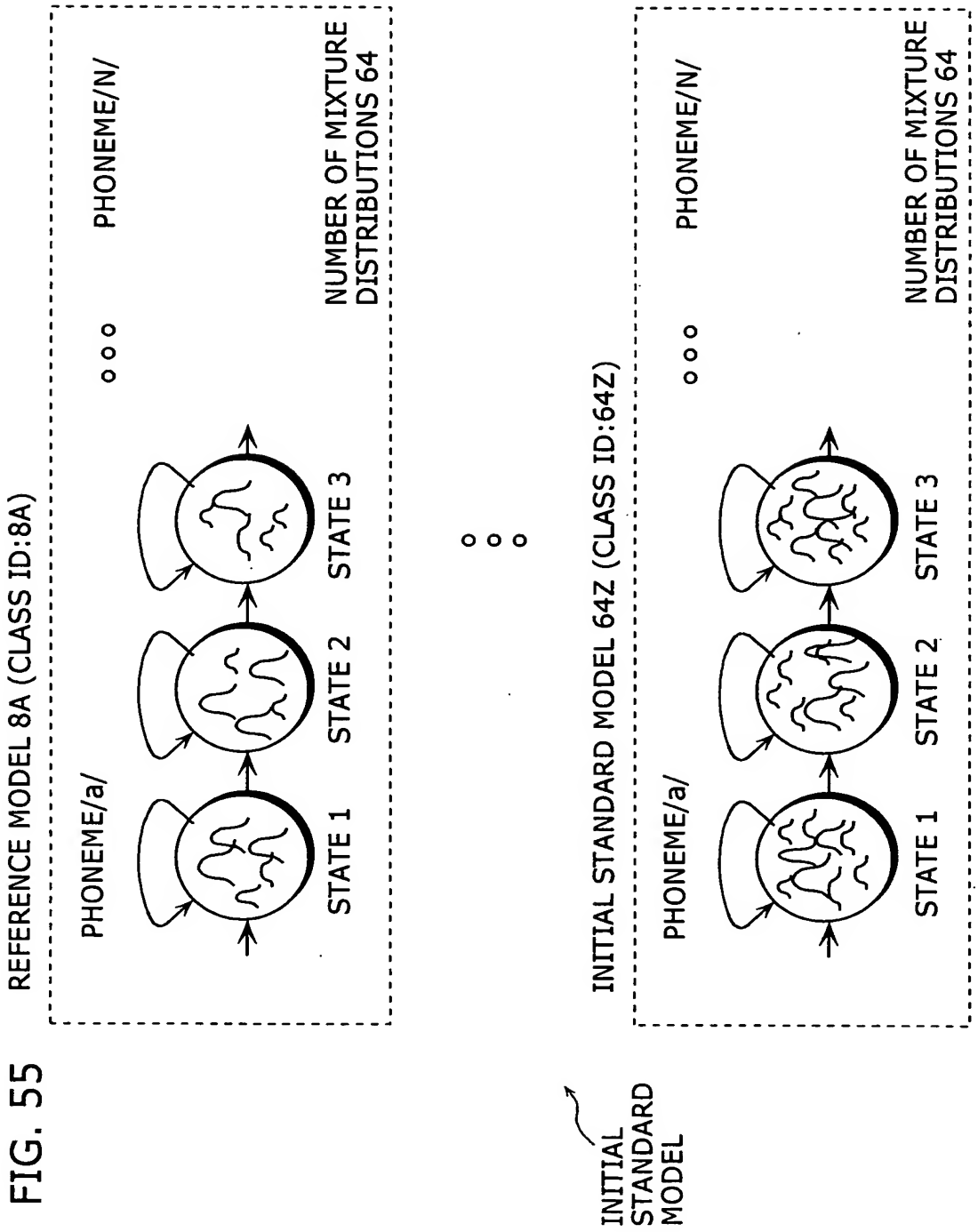
REFERENCE MODEL 8A (CLASS ID:8A)
PHONEME/a/
PHONEME/N/
STATE 1
STATE 2
STATE 3
NUMBER OF MIXTURE DISTRIBUTIONS 64
INITIAL STANDARD MODEL 64Z (CLASS ID:64Z)
PHONEME/a/
PHONEME/N/
STATE 1
STATE 2
STATE 3
NUMBER OF MIXTURE DISTRIBUTIONS 64
INITIAL STANDARD MODEL

FIG. 56

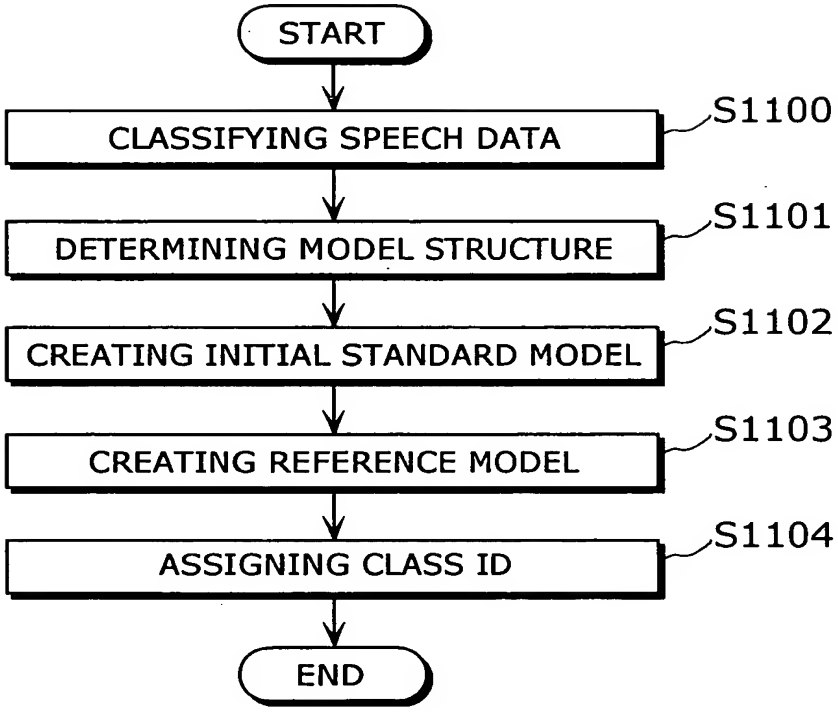
START
CLASSIFYING SPEECH DATA
S1100
DETERMINING MODEL STRUCTURE
S1101
CREATING INITIAL STANDARD MODEL
S1102
CREATING REFERENCE MODEL
S1103
ASSIGNING CLASS ID
S1104
END

FIG. 57

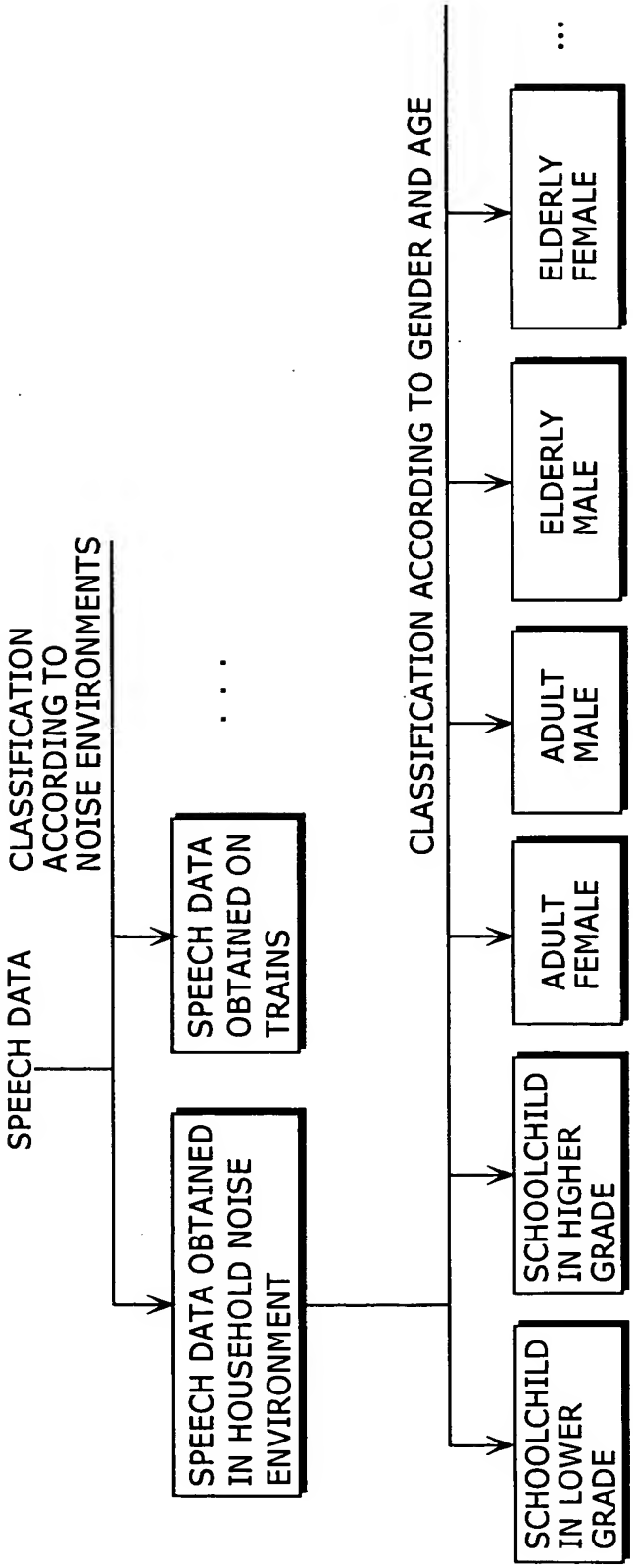
SPEECH DATA
CLASSIFICATION ACCORDING TO NOISE ENVIRONMENTS
SPEECH DATA OBTAINED ON TRAINS
SPEECH DATA OBTAINED IN HOUSEHOLD NOISE ENVIRONMENT
CLASSIFICATION ACCORDING TO GENDER AND AGE
ELDERLY FEMALE
ELDERLY MALE
ADULT MALE
ADULT FEMALE
SCHOOLCHILD IN HIGHER GRADE
SCHOOLCHILD IN LOWER GRADE

FIG. 58

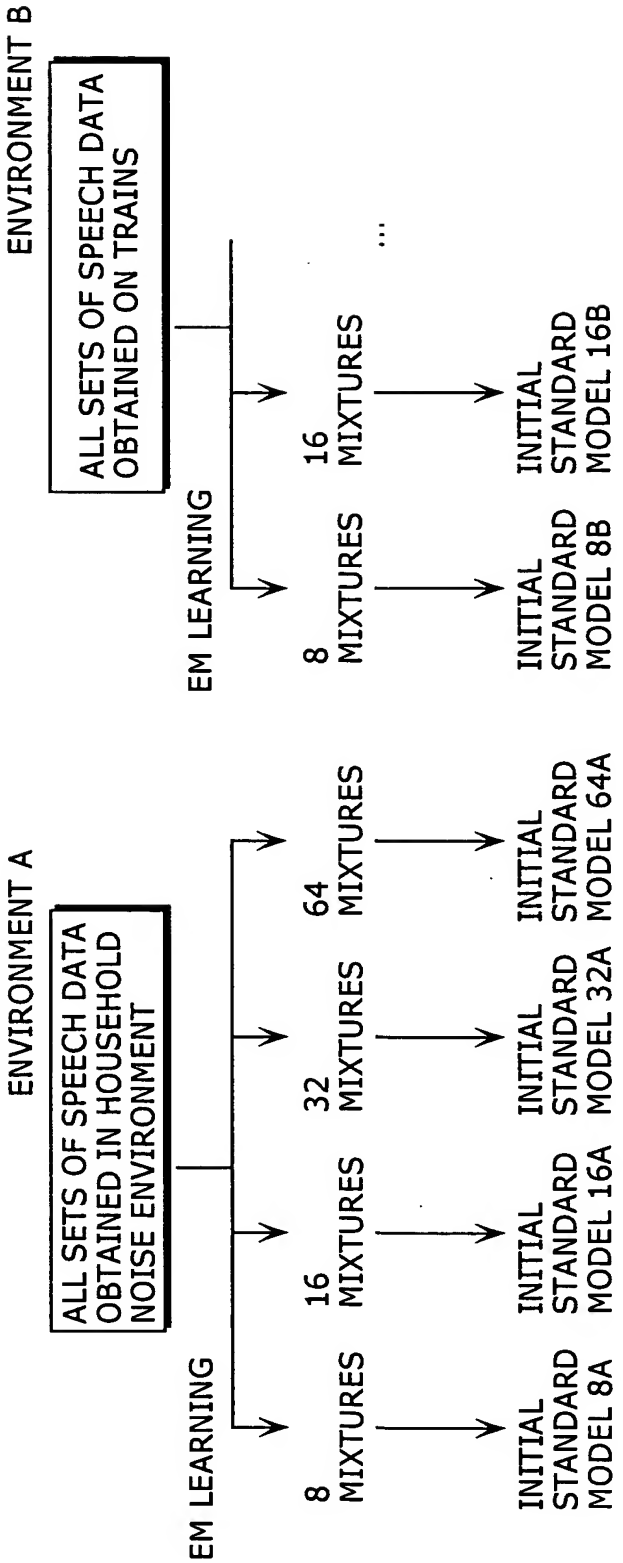
ENVIRONMENT A
ALL SETS OF SPEECH DATA OBTAINED IN HOUSEHOLD NOISE ENVIRONMENT
EM LEARNING
8 MIXTURES
16 MIXTURES
32 MIXTURES
64 MIXTURES
INITIAL STANDARD MODEL 8A
INITIAL STANDARD MODEL 16A
INITIAL STANDARD MODEL 32A
INITIAL STANDARD MODEL 64A
ENVIRONMENT B
ALL SETS OF SPEECH DATA OBTAINED ON TRAINS
EM LEARNING
8 MIXTURES
16 MIXTURES
INITIAL STANDARD MODEL 8B
INITIAL STANDARD MODEL 16B

FIG. 59

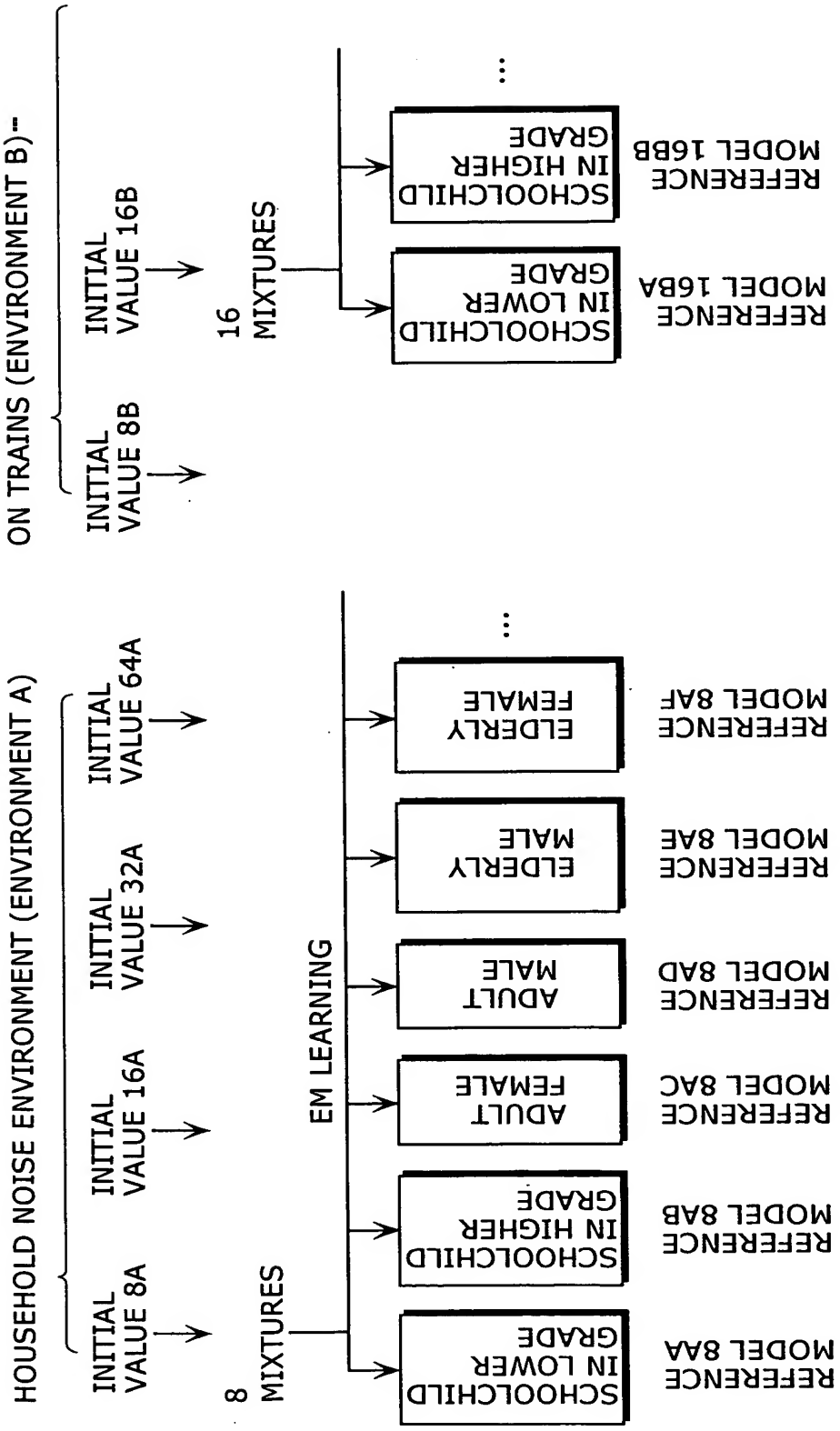
ON TRAINS (ENVIRONMENT B)--
INITIAL VALUE 16B
INITIAL VALUE 8B
16 MIXTURES
REFERENCE MODEL 16BB
SCHOOLCHILD IN HIGHER GRADE
REFERENCE MODEL 16BA
SCHOOLCHILD IN LOWER GRADE
HOUSEHOLD NOISE ENVIRONMENT (ENVIRONMENT A)
INITIAL VALUE 64A
INITIAL VALUE 32A
INITIAL VALUE 16A
INITIAL VALUE 8A
8 MIXTURES
EM LEARNING
REFERENCE MODEL 8AF
ELDERLY FEMALE
REFERENCE MODEL 8AE
ELDERLY MALE
REFERENCE MODEL 8AD
ADULT MALE
REFERENCE MODEL 8AC
ADULT FEMALE
REFERENCE MODEL 8AB
SCHOOLCHILD IN HIGHER GRADE
REFERENCE MODEL 8AA
SCHOOLCHILD IN LOWER GRADE

FIG. 60

CLASS ID	INITIAL STANDARD MODEL	REFERENCE MODEL	REMARKS (CHARACTERISTICS OF REFERENCE MODEL)
8A	INITIAL STANDARD MODEL 8A	REFERENCE MODEL 8AA	HOUSEHOLD NOISE, 8 MIXTURES, SCHOOLCHILD IN LOWER GRADE
		REFERENCE MODEL 8AB	HOUSEHOLD NOISE, 8 MIXTURES, SCHOOLCHILD IN HIGHER GRADE
		REFERENCE MODEL 8AC	HOUSEHOLD NOISE, 8 MIXTURES, ADULT FEMALE
		⋮	⋮
16A	INITIAL STANDARD MODEL 16A	REFERENCE MODEL 16AA	HOUSEHOLD NOISE, 16 MIXTURES, SCHOOLCHILD IN LOWER GRADE
		REFERENCE MODEL 16AB	HOUSEHOLD NOISE, 16 MIXTURES, SCHOOLCHILD IN HIGHER GRADE
		REFERENCE MODEL 16AC	HOUSEHOLD NOISE, 16 MIXTURES, ADULT FEMALE
		⋮	⋮
⋮	⋮	⋮	⋮
64B	INITIAL STANDARD MODEL 64B	REFERENCE MODEL 64BA	ON TRAINS, 8 MIXTURES, SCHOOLCHILD IN LOWER GRADE
		REFERENCE MODEL 64BB	ON TRAINS, 8 MIXTURES, SCHOOLCHILD IN HIGHER GRADE
		REFERENCE MODEL 64BC	ON TRAINS, 8 MIXTURES, ADULT FEMALE
		⋮	⋮

FIG. 61

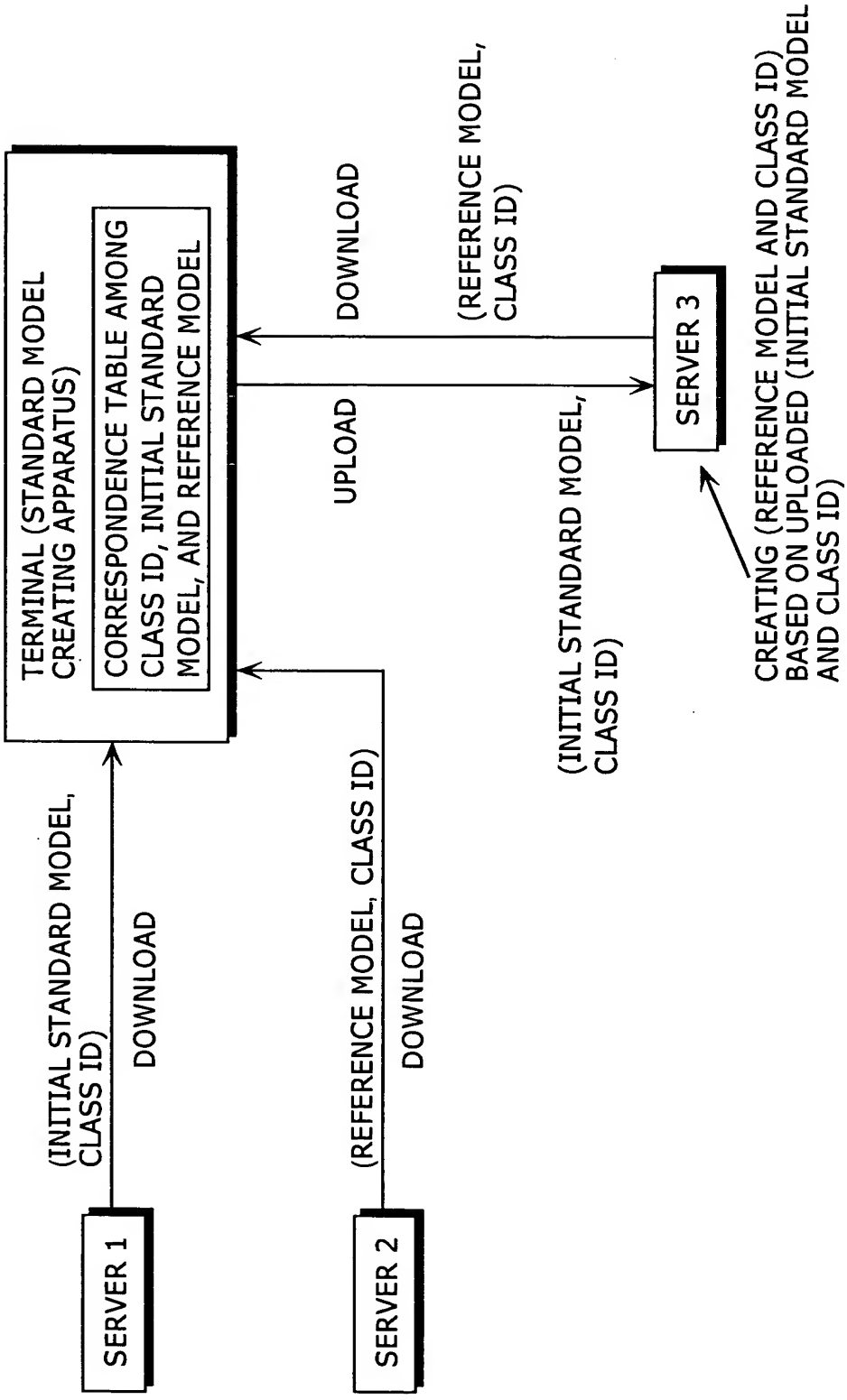
TERMINAL (STANDARD MODEL CREATING APPARATUS)
CORRESPONDENCE TABLE AMONG CLASS ID, INITIAL STANDARD MODEL, AND REFERENCE MODEL
SERVER 1
SERVER 2
SERVER 3
(INITIAL STANDARD MODEL, CLASS ID)
DOWNLOAD
(REFERENCE MODEL, CLASS ID)
DOWNLOAD
UPLOAD
(INITIAL STANDARD MODEL, CLASS ID)
(REFERENCE MODEL, CLASS ID)
DOWNLOAD
CREATING (REFERENCE MODEL AND CLASS ID) BASED ON UPLOADED (INITIAL STANDARD MODEL AND CLASS ID)

FIG. 62

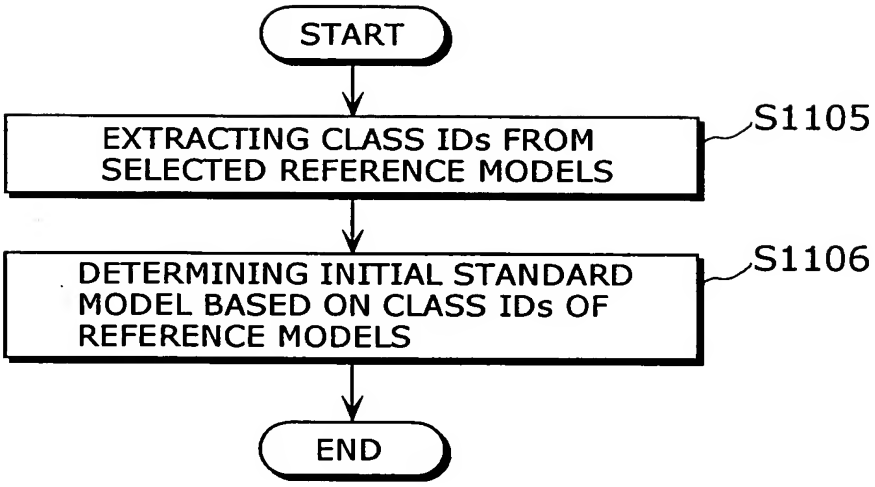
START
EXTRACTING CLASS IDs FROM SELECTED REFERENCE MODELS
S1105
DETERMINING INITIAL STANDARD MODEL BASED ON CLASS IDs OF REFERENCE MODELS
S1106
END

FIG. 63

SELECTED REFERENCE MODELS	CLASS ID
SELECTED REFERENCE MODEL 8AA	8A
SELECTED REFERENCE MODEL 16AA	16A
SELECTED REFERENCE MODEL 16AB	16A
SELECTED REFERENCE MODEL 16AC	16A
SELECTED REFERENCE MODEL 16BA	16B
SELECTED REFERENCE MODEL 64BA	64B

FIG. 64

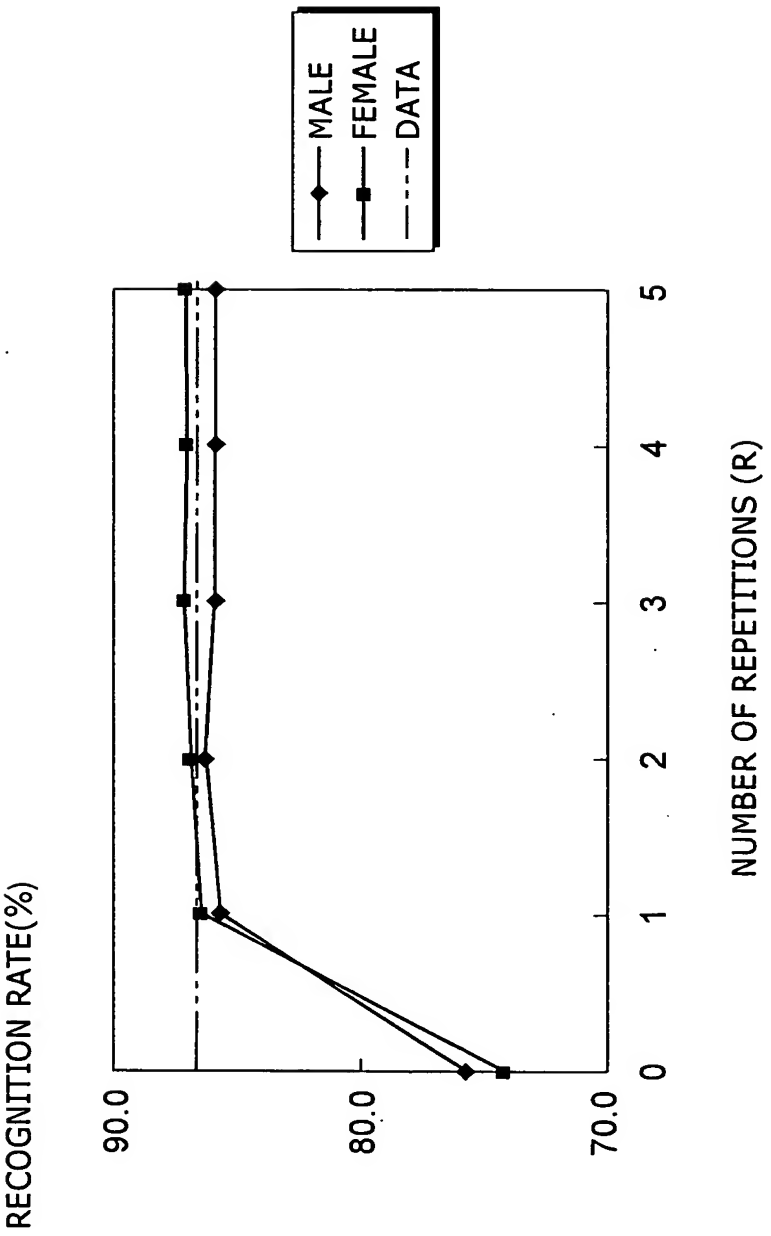
MALE
FEMALE
DATA
RECOGNITION RATE(%)
90.0
80.0
70.0
0
1
2
3
4
5
NUMBER OF REPETITIONS (R)

FIG. 65A

AGE	CHILD	ADULT	ELDERLY
STRUCTURE	64 MIXTURES	16 MIXTURES	100 MIXTURES

Reason: Due to variations in voices of children and the elderly, large number are set for their mixtures to create high-precision model.

FIG. 65B

GENDER	FEMALE	MALE
STRUCTURE	16 MIXTURES	64 MIXTURES

Reason: Variations in male voice are greater than those in female voice.

FIG. 65C

TEXTURE OF SPEAKER'S VOICE	NORMAL	HUSKY	HOARES
STRUCTURE	16 MIXTURES	64 MIXTURES	100 MIXTURES

FIG. 65D

TONE OF VOICE WITH EMOTIONS	NORMAL	ANGRY VOICE	CRYING /LAUGHING VOICE
STRUCTURE	16 MIXTURES	64 MIXTURES	100 MIXTURES

FIG. 65E

SPEAKING RATE	NORMAL	FAST/SLOW
STRUCTURE	16 MIXTURES	100 MIXTURES

FIG. 65F

CIVILITY IN UTTERANCE	DECLAMATORY TONE	ADDRESSING TONE	CONVERSATIONAL TONE
STRUCTURE	16 MIXTURES	64 MIXTURES	200 MIXTURES

FIG. 65G

DIALECT	STANDARD LANGUAGE	OSAKA DIALECT	KAGOSHIMA DIALECT
STRUCTURE	16 MIXTURES	100 MIXTURES	200 MIXTURES

FIG. 65H

BACKGROUND NOISY (SN RATIO)	QUIET (30dB)	SLIGHTLY NOISY (20dB)	NOISY (10dB)
STRUCTURE	200 MIXTURES	64 MIXTURES	10 MIXTURES

Reason: If noisy, ambiguous model with a small number of mixtures can respond to variations in noise types.

FIG. 65I

MICROPHONE	STANDARD	LOW LEVEL	HIGH LEVEL
STRUCTURE	16 MIXTURES	10 MIXTURES	100 MIXTURES

FIG. 65J

COMPLEXITY IN RECOGNIZABLE VOCABULARY	WORD (SIMPLE)	SHORT SENTENCE	LONG SENTENCE (DIFFICULT)
STRUCTURE	10 MIXTURES	64 MIXTURES	200 MIXTURES